





This is the kitchen

My name is Saturday (mechanic)

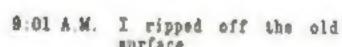
I'm a husband

The sink top is rotted

My job







9:57 A.M. Scraped the plywood core of the sink top clean of old mastic.

10:32 A.M. Went to my lumber dealer to buy Formica.

10:33 A.M. Looked for the Formica Trade-Mark on the sheets to be sure it was genuine--It was.

11:05 A.M. Marked and sawed Formica to size for new top and backsplash. Used carpenter's saw--worked fine.

12:15 P.M. Spread Formica Contact
Bond Cement on back of
Formics and on plywood

12:44 P.M. Knocked off for lunch while cement was drying.

1:30 P.M. Applied cemented back of Formics to cemented top of cabinets. Used ordinary rolling pin.

1:51 P.M. Filed edges of Formics, applied metal moldings.

2:30 P.M. Had a beer Accepted kies from lady of the house. CASE SOLVED.

Foreign semples and complete (linetrated instructions for doing-it-yourself with Fermica, Write to The Poreign Company, 4585 Spring Grove Ave. Cincinnati 32. 0.

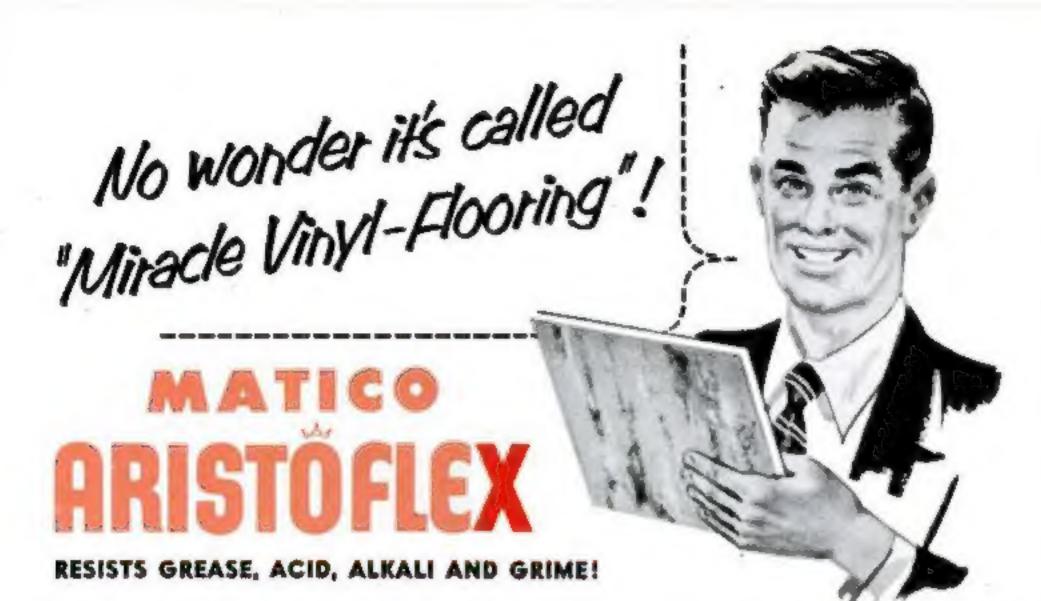


This mark certifies genuine

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With a notched trowel, spread adhesive over onehalf of your room at a time. leave only a thin coat of adhesive on the floor.



After adhesive becomes tacky, snap the tiles into place. Do not slide tiles or adhesive will push up between the tiles.



Here's the best parti Show your wife your handlwork. (Don't tell her what a cinch it is with MATICO's easy-to-follow instructions).

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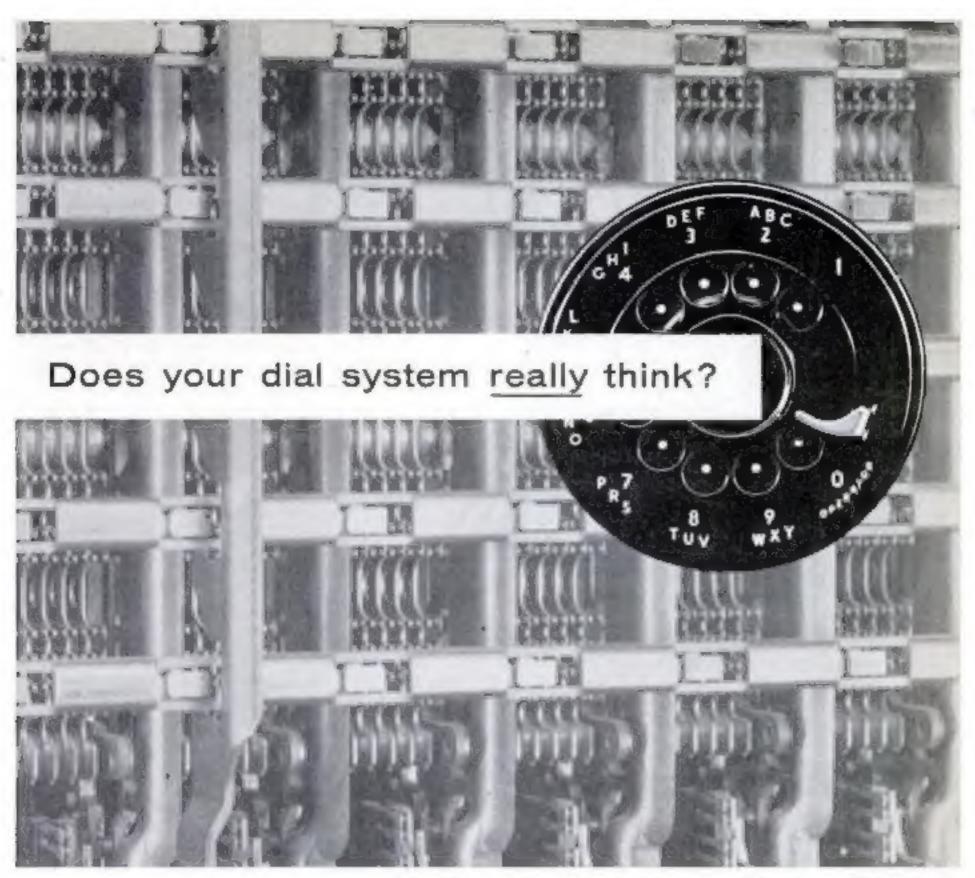
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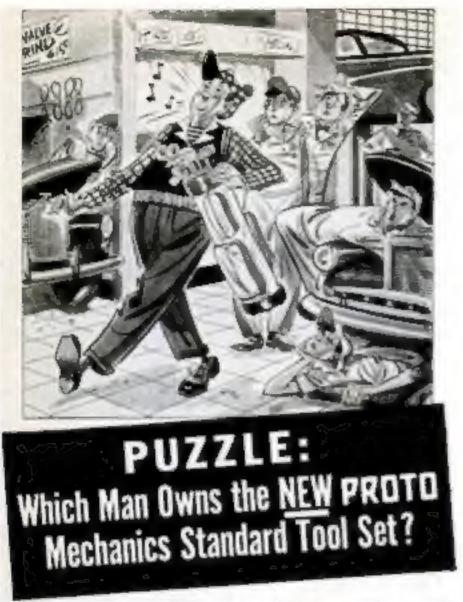
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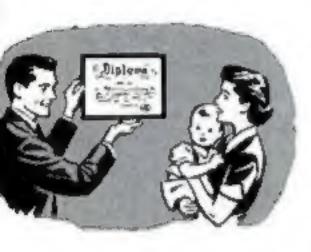
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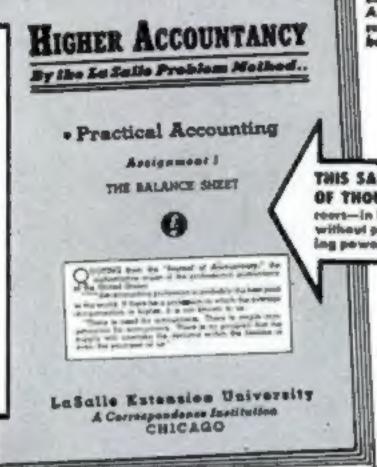
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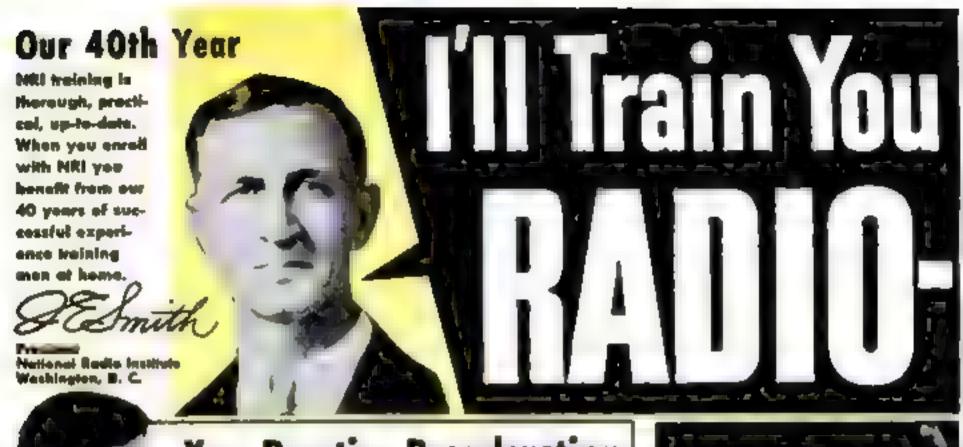
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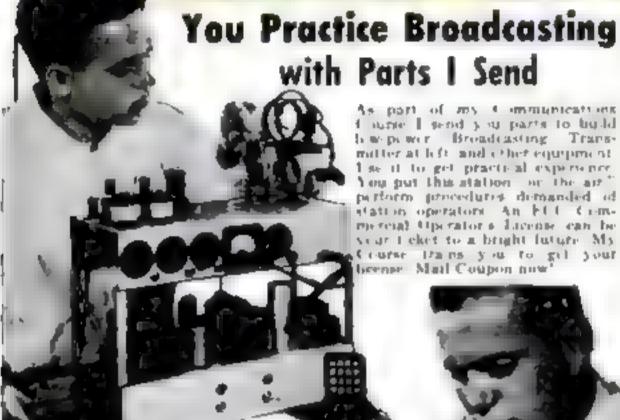
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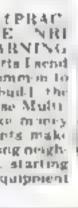
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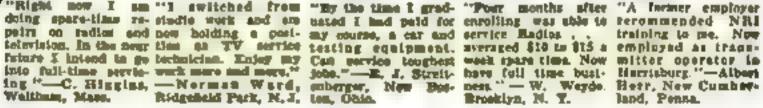
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Letters_

Who's Spoofing Whom?

All those reports of flying saucers being sighted recently in Europe started me thinking. And when our Air Force said it was going to look into this strange business, a light went on inside my head.

Could the saucers be "spoofing devices"—new kinds of defense weapons that can create false targets in the sky? The false targets would trick enemy guided missiles into exploding harmlessly in the air instead of on cities and military installations—real targets—on the ground.

We know that guided missiles can aim themselves by radar, optical or heat devices. They hunt and follow a certain shape (like an airplane) or a certain heat pattern (like an engine or an industrial plant) or lights (starlight or an illuminated city).

Now it shouldn't be too difficult to imitate what the missiles are looking for. There might be a way to throw the heat, light or electrical pattern into the air, either from the ground or from planes. There might be expendable defense missiles arranged to appear to the attacking missile's guidance system like a city or a factory.

I don't know, of course, that our military is doing any such thing. And the military certainly isn't talking. But spoofers would surely explain a lot—particularly why so many saucers have been sighted over important defense bases.

THOMAS C. DEMARS, East Berlin, Conn.

Well, your theory sounds plausible, but how are you going to explain the fact that there have been similar sightings for hundreds of years (May '52, p. 45)?

Columbus' Ship Was a Tub

Henry B. Comstock's "3 Men and a Ship Kit" (Dec. '54, p. 183) expresses the finest traditions of model building. But why didn't

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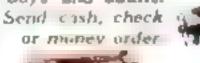
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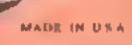
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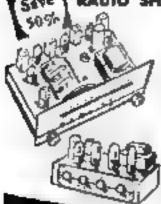
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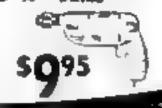


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6 POPULAR SCIENCE

Super-Scale Smith buy the enlarged plans of the Santa Maria, which are on the market for \$1.50, and then have them photostated to any size he wanted?

WILLIAM T. MOON, New York

Unfortunately, Super-Scale Smith didn't know about those plans. But he doesn't regret the time he spent on research, for now he knows that practically every model of Columbus' flagship is based on a wholly inaccurate replica exhibited at the 1893 World's Fair in Chicago. The real Santa Mana was a clumsy carrack, an ugly tub

Tribute from the Transvaal

I am a practicing Christian and do not see my way clear to read all types of secular magazines. I do, however, enjoy and find relaxation in your monthly magazine. I only wish that it did not cost so much out here in South Africa. At any rate, it is worth it, and I enjoy going through every article and all the ads.

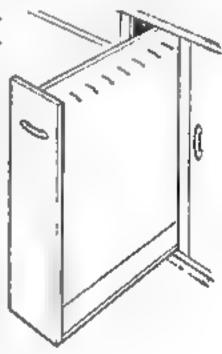
JAN D. ELS, Eureka, South Africa

Building Kitchen Cabinets

The article you published last September (p. 112) on building kitchen cabinets will be very helpful when I modernize our kitchen next summer. But I wish you had included something on the pull-out storage racks that are seen in so many modern kitchens. Know where I could find plans for these?

HERBERT TEETZ, Philadelphia

You'll find plans for these, and many other types of kitchen cabinets, in How to Build Cabinets for the Modern Kitchen, a new book by R. P. Stevenson, assistant managing editor of Popular Science Monthly. It is published by Summons-Boardman Publishing Corp., 30 Church St, NYC 7.



"Rash" Was a Wise Choice

"Do people still give their cars names?" you asked in the December letters column.

Answer: "Yes."

I was a Fulbright exchange teacher in England in 1951. My wife and I decided

INVENTORS

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that if we wanted to see Europe on a teacher's salary, we should purchase a car. In spite of inflation and all advice to the contrary, we bought a 12-horsepower English Austin, 1938 model. Knowing all our arguments were rationalization, we called the car Rash.

The name proved to be ill-chosen, for we drove her 20,000 miles, toured 18 countries, saved hundreds of dollars on travel cost, and with tears in our eyes sold Rash for \$110 profit when we left England.

K. DEANE STOUT, Knoxville, Tenn.

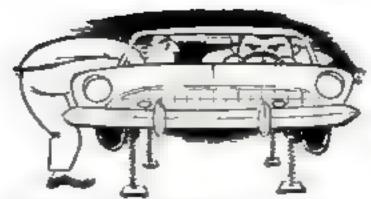
Cynics Leer at '55 Cars

When they get around to putting retractable wings on our new "brute" cars (Dec. '54, p. 135), will the driver need a pilot's license?

C. McAteer, Staten Island, N.Y.

The automobile builders haven't even begun to fight in '55. Why don't they get down to business and make cars that are really complicated?

For '56, for instance, they might add built-in hydraulic facks to hoist the car up so the occupants will not have to crawl in—



operated by push button, of course. They might install a 110-volt storage battery with 55 cells. Or a power booster to help push the starter. There could even be power solenoids to press each push button, operated by electric-eye controls.

C. W. RICKMAN, Warrensburg, Mo.

Qus Ran a Risk

In your October story about Gus Wilson (p. 170), Gus switched two plug wires, thereby causing backfire to temporarily clear the carburetor jets. Then he switched them back to their proper plugs. How could he do thus without getting a terrific shock, since he was grounded through the fender?

Sarkis Dodakian, Worcester, Mass.

Gus was under pretty heavy plat pressure when he did this, remember, but he could

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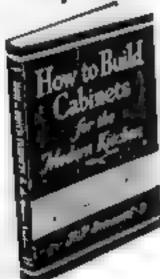
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have done it with those deft and daring fingers of his, if he took care to keep his fingers back from the bare ferrule.

Sick Clock Regains Health

I sure do thank you for the article in the November issue (p. 226) on how to repair electric clocks. Our clock sounded like it



was ready to fly to pieces, but after giving it a treatment according to your prescription, it ran quietly and accurately. It still does. Your magazine is the best of its kind.

ROBERT E. HENLEY, New Cambria, Mo.

Homemade Midget Car

Here is a photo of a midget car I have built for my children. It is about 7% feet long, three feet wide, two feet high, and



weighs about 325 pounds. It has a threehorsepower Clinton motor with a centrifugal clutch and travels 20 to 25 miles an hour. SAMUEL A. MOOBEHEAD, Akron

Army's Mechanical Dog

In "Tractor Replaces the Sled Dog" (Dec. '54, p. 87), you state that the vehicle has a four-cylinder Crosley engine. Parts at the front of the vehicle resemble the duct work for air-cooling a one-cylinder engine. Just what engine is used?

JOHN A. ENGLISH, Troy, N.Y.

The Army's official caption clearly states that the engine is a four-cylinder Crosley We can only assume that the duct leads to the conventional fan and radiator of the Crosley engine

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You've often heard Arthur Godfrey, famed "Huck Finn of Radio," on his coast-to-coast "Talent Scouts" and other CBS programs—now winning new renown on television. But this is the first time you've heard the star on the subject of I. C. S.:

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As usual, the former Navy radio operator and present Commander in the U.S. Naval Reserve knows what he's talking about. As an I.C.S. graduate, Mr. Godfrey is in the best of all positions to tell you about the educational system that's served so long as talent scout for American industry.

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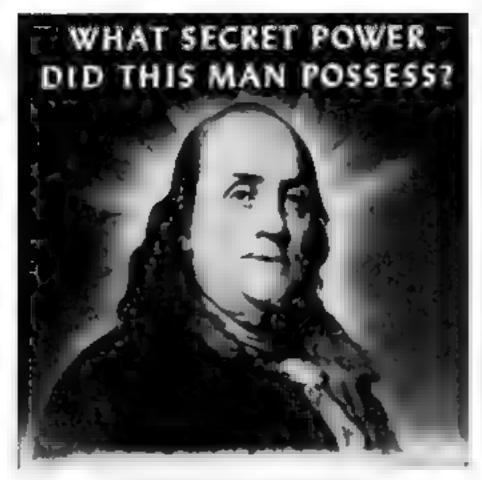
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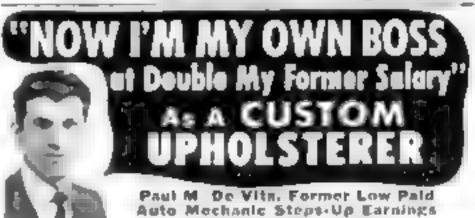
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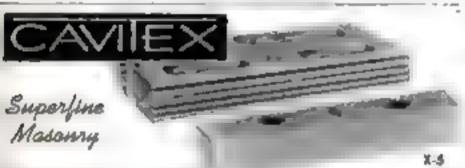
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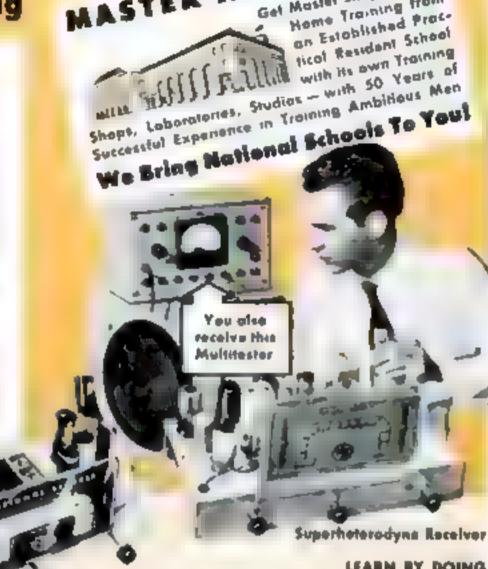
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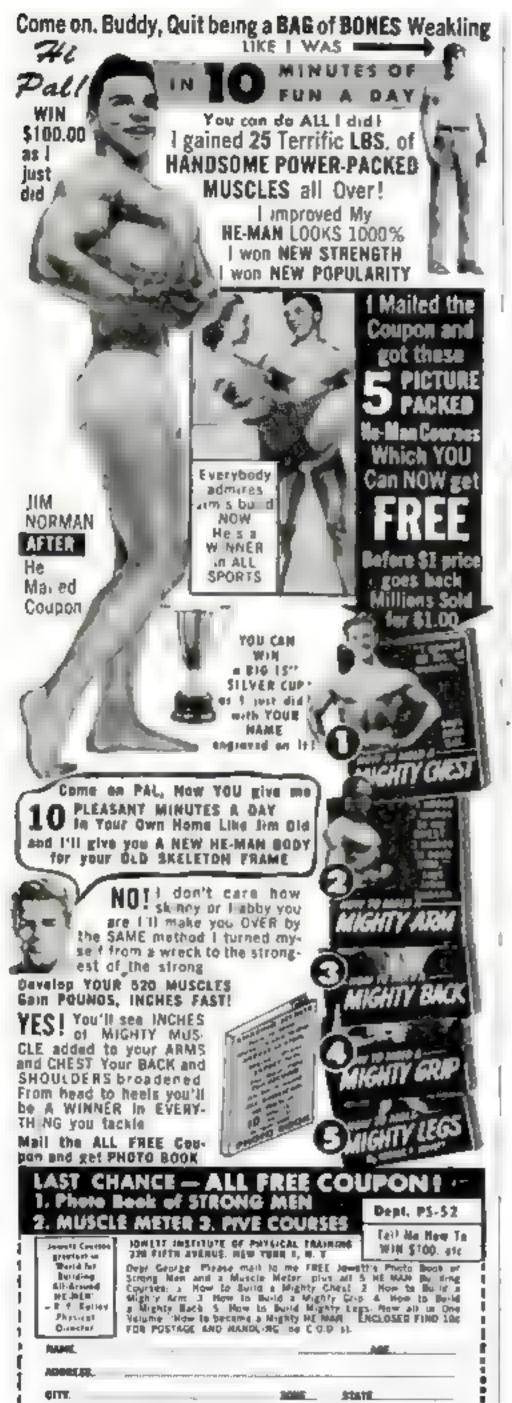
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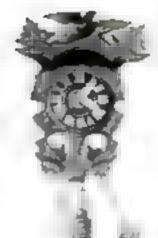
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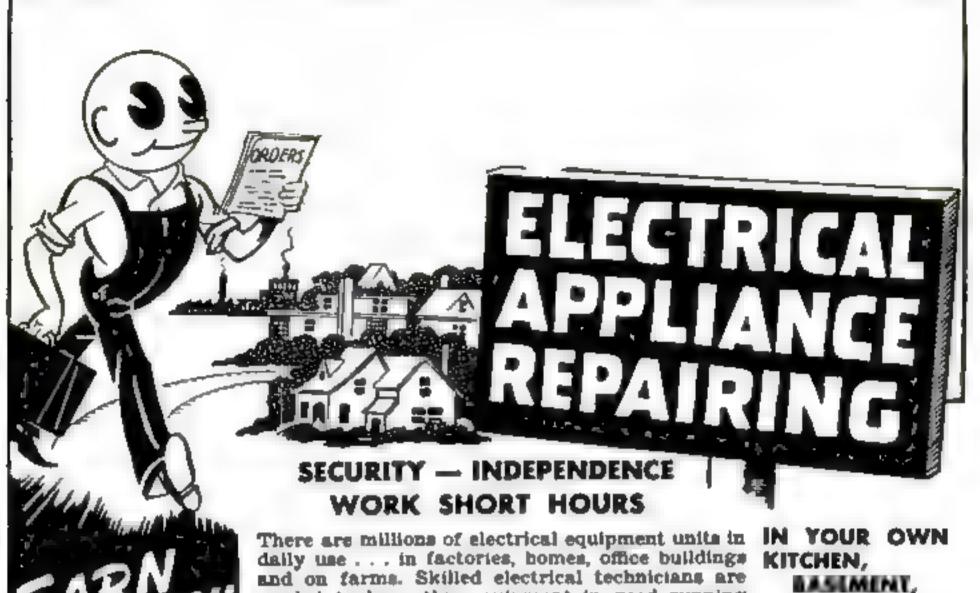
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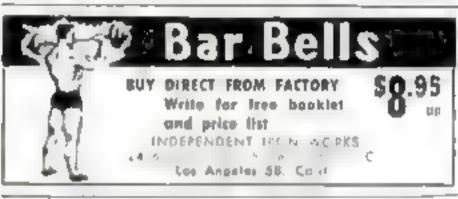
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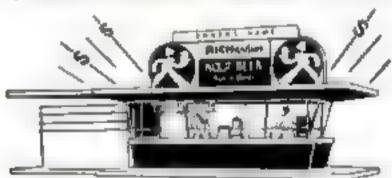
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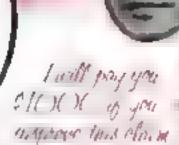
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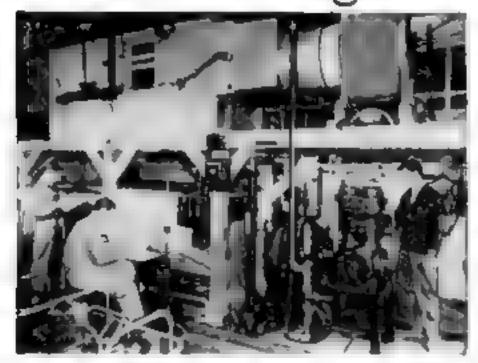
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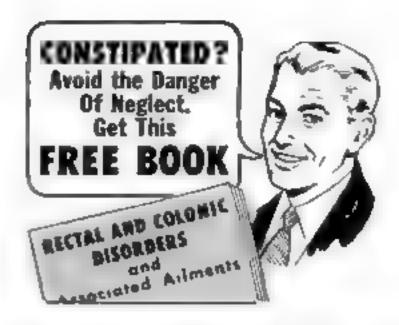
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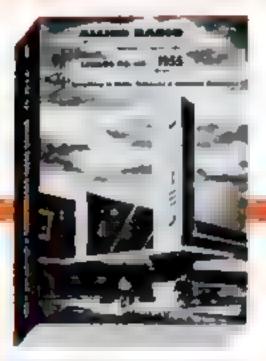
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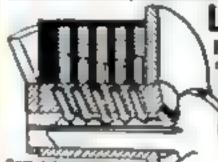
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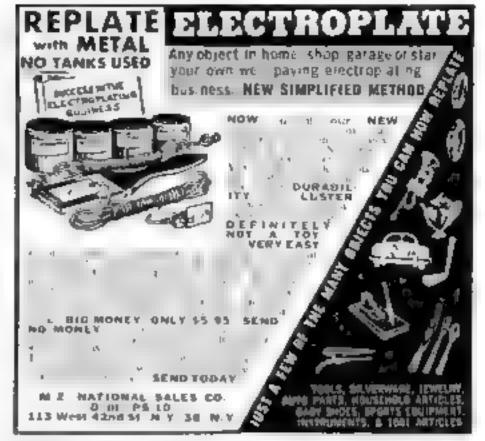
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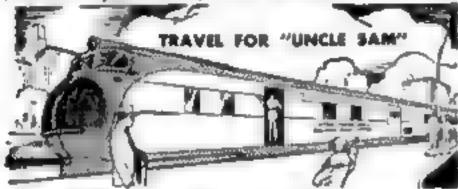
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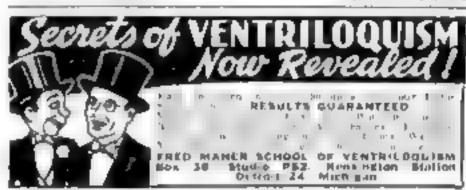
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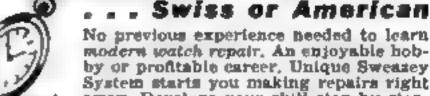


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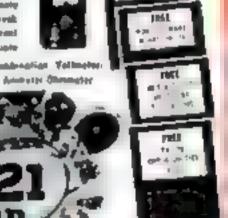
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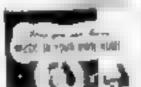
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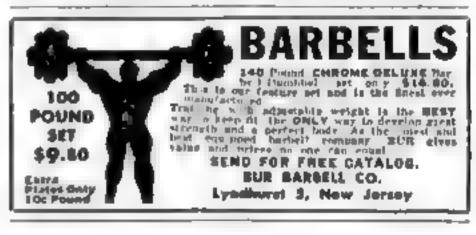
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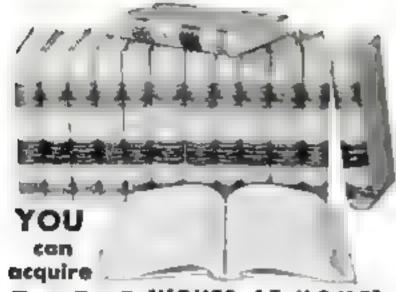
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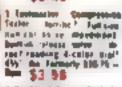
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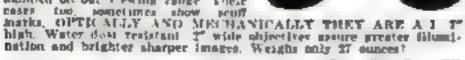
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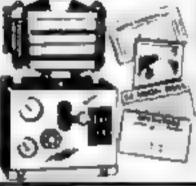
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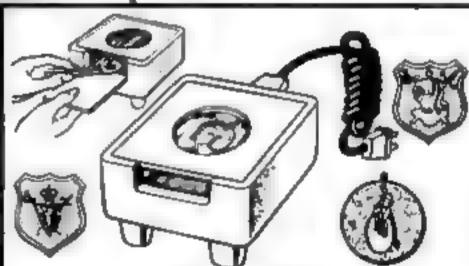


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CARRES. I personally guided his story when he invented an automatic punts proses. He duried with one title and in one magazine. For years lefer he extend — with enough real extent to heap him in costs from a the rest of his Mo.

Wall MARK I worked with him for the years. I met him when he may a wagen man for a ten and suffer house, knothing on doors. He want into MaR Craims on nothing—made money from the start on and any six years later with savings of \$10,000 and an income of \$30,000 and an income of \$30,000.00 a year fact the without further work.

OUGGAIL, A law years upo he was a truck driver. Started fooling with Mad Order in a spare room in his spore time. hast year he sold, "I don't know how much i'm worth—after you get the first million you guit begaing truck."

MEL PRICON. Searced a small Mell Order husbass of home-just to beap eccupied. It tooked good and she came to me for galvice. I showed her how to suppord, in how yeges the husbass got to higher husband resigned his jub to help moreone it.

FORMARL Finances worked on a both setting at \$70 a week, the kept of a fining in the evenings—raw are and offering operating he slide? I have reget to many orders he had to find a terest of septing. He made \$ 8,000 the first year, the gives me treath for "showing the way."

PORGERSON. Considered no about a specialty product. On my advice he can are up to 1 feet. He calcability frost and brought sales of \$50,000 to bis first year he slid a business of rearly a half million dollars. His original forestment was last than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own furture was made in Mail Order. And note my morets can be yours.

L. W.

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Glance at the examples at left. These true stories are far from unusual Multiply them by the hundreds and you begin to get an idea of what can be done... what is being done... in the phenomenal Mail Order field.

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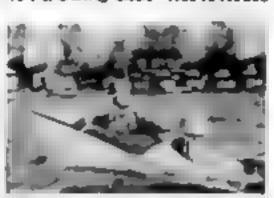
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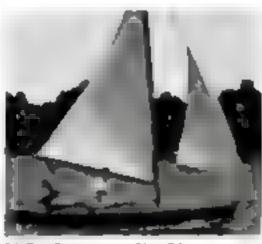
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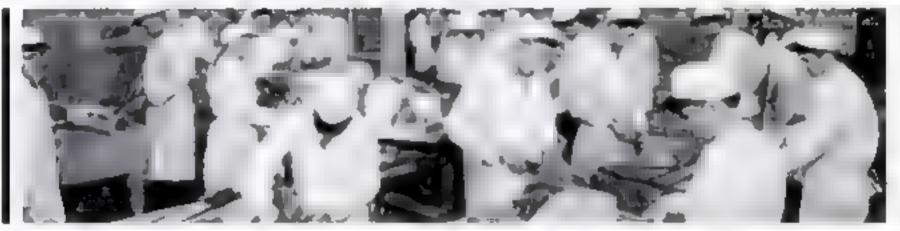


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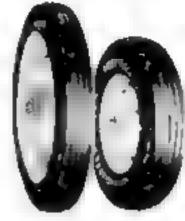
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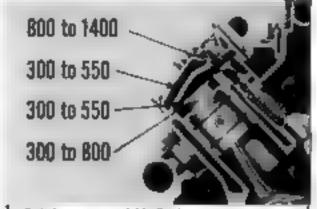
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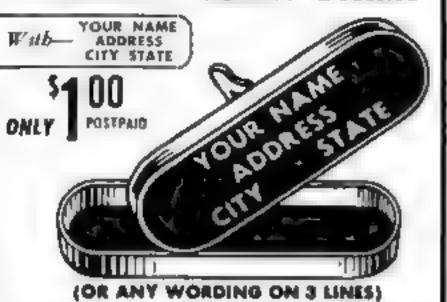
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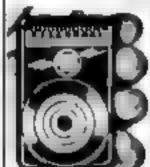
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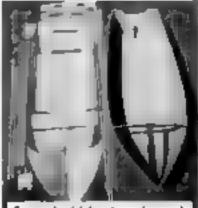
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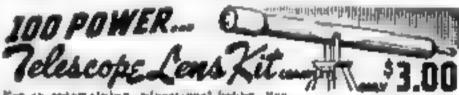
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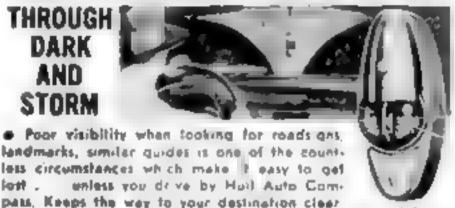
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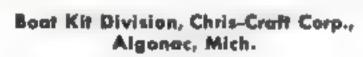
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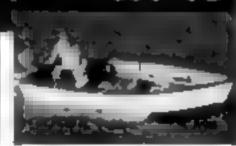
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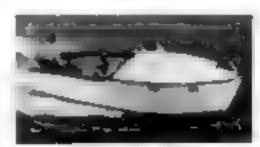
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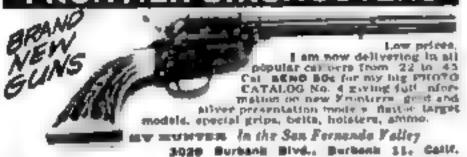
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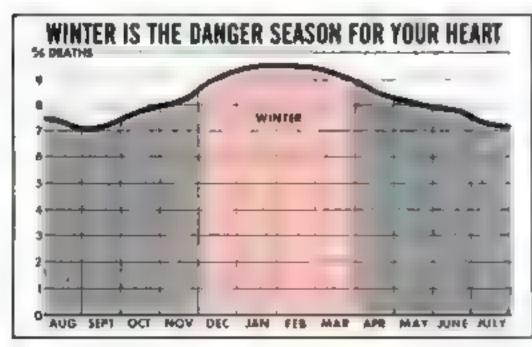
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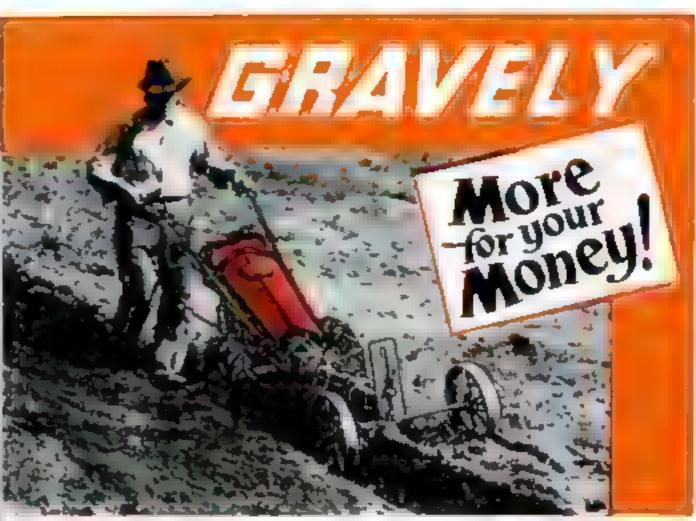
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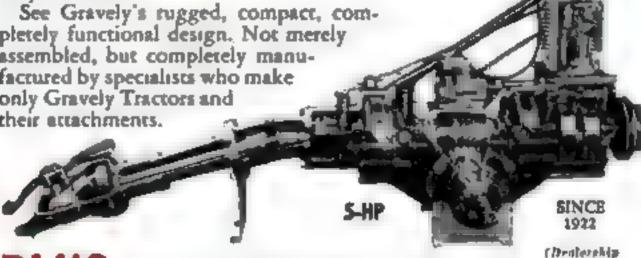


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Your choice of 21 tools for a versatile tractor that saves time, work and worty all year long. Tools to do every mowing, gardening, field and farm job.

Send coupon today for "Power vs. Drudgery", the big booklet that shows how Gravely equipment solves your upkeep and gardening problems . . . faster, easter, better! Ask about NEW EASY PAY PLAN,

GRAVELY TRACTORS, INC. BOX 284 DUNBAR, W. VA. Please send me "Power vs. Drudgery" Booklet and dealer's name. NAME

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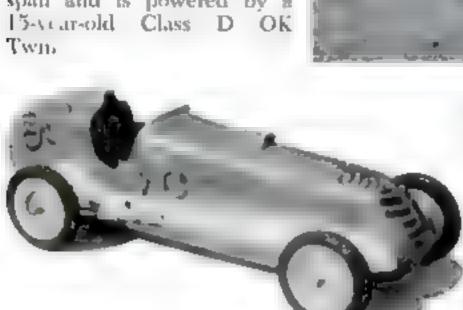
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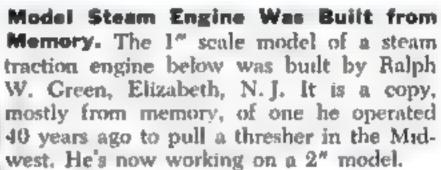
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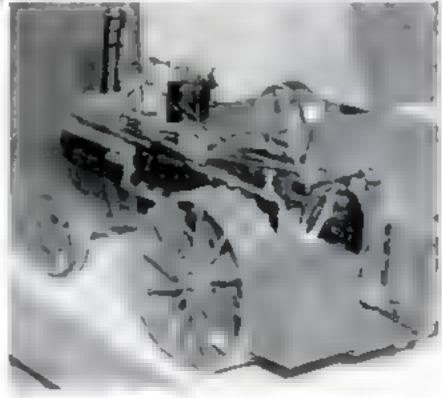
CRAFTSMEN AT WORK

Model Logs 1,000 Flights. Only one muor landing crack-up in 1,000 flights over a period of 10 years is the record of this scale Piper Cruiser built by Howard Yonkers, San Mateo, Calif., a member of the Pentisula Prop Twisters. The Piper has a 7' span and is powered by a 15-year-old Class D OK



Midget Racer Does 100 M.P.H. For 14 years C. Evans Codding has been setting records here and abroad with model racing cars that are as mechanically perfect as they are realistic. The five-pound Indianapolis free-lancer shown here has a magnesium body and east-aluminum chassis, it is fully sprung, equipped with shocks, working brake, and front-wheel drive. Engine is a 10-cc. one-lunger, converted to semi-diesel. Souped up with twin carburetors and dual rotary intake ports, it develops X hp. at 10,000 r.p.m. and a speed of 100 m.p.h.







Tiny Cannons Made of Brass. A. L. Bent of Granville Ferry, Nova Scotta, who keeps a file of Popular Science Monthly, went back to the January, 1947, issue for plans for making the model brass cannons you see at the left. First fashioning his own lathe attachments to make the work easier, he has made 12 of the little cannons from PSM plans and at last report was on his 13th.



Something New , something wonderful has happened to outboard boating!

Gone is the barrier of jangling sound that stood between you and complete enjoyment of the water!

Gene are the stredent engine noises—the rancous "lows"—the shrill "highs"—throughout the full range of objectionable sound frequencies. We've tuned them out... or sealed them in ... muffled them ... canceled them! At all speeds—slow, medium, top! We've left you nothing to hear but the swish of the bow wave beneath the motor's pleasant purr.

Gone, too, is nerve wracking vibration. Gone is the arm-tiring tingle of the steering handle. Gone is all "engine shake" from the hull... completely isolated from boat and passengers by the all-direction cushioning of Aquaionic mountings. We've left you nothing to feel but the boundless surge of power that is utterly smooth!

Here is your future in boating fun ... Whispering Power, amouth as sailing! It's yours to enjoy in any size boat, small family runabout to cruiser. See your Evinrude dealer—look for his name under "Outboard Motors" in the yellow pages of your phone book. Choose from a complete range of Aquasonic models, 7½ to 25* horsepower. Time payments available. For free full-color catalog of the 1955 Evinrude line, write EVINRUDE MOTORS,



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Big full-color catalog
describes complete line
of Evitrude models for
1955. Priced as low as
\$145 for the Lightwin
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Drive. Send for your

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Dig Profits foractic with electric starting

Last word in time outboard performance! Big Twin's 25 thrilling horsepower, now velvet smooth and whisper quiet. Plan linger-touch starting... electric starting that you know is right... tested and proved in millions of miles \$525 of owner service.

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Standard Brg Twin Aquasonic...\$430





1955 MERCURY

Features the World's Most
Modern Spark Plugs...

NEW TURBO-ACTION CHAMPIONS!







Greater clearance in the firing end permits turbulent
gases to keep the insulator
free of harmful deposits.
Heat range, the temperafure zone in which spark
plugs operate efficiently, is
extended to the widest
limits in automotive
history.

Exclusive, tapered Turbo-Action seating design forms a positive lock with a mating surface in the cylinder bead without use of a gasket. Correct installation is automatic and Turbo-Action spark plugs remain firmly fixed and accurately positioned in the combustion chamber.

AT ALL LINCOLN, MERCURY AND OTHER CHAMPION DEALERS

More evidence that the new fursio-Action Champions are the spark plugs in your future:

Another producer of great motorcars— Mercury—now features these sensational new spark plugs as standard equipment on its power-packed 1955 models!

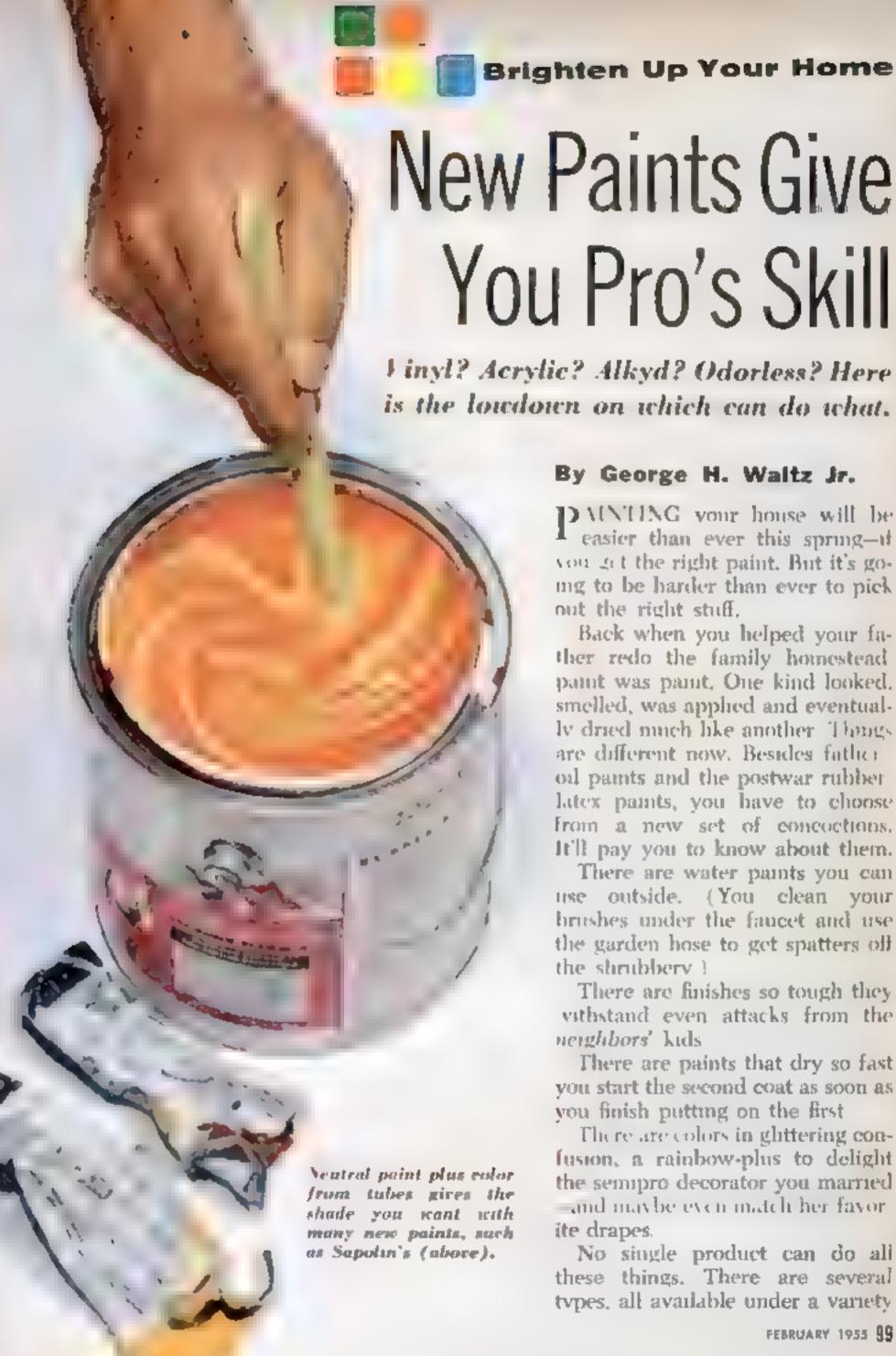
Champion FUEBO-ACTIONS—with the widest operating range in automotive history—allow you to enjoy to the fullest extent the benefits of charply increased compression ratios and horsepower of advanced-design power plants. And they supply the entire automobile industry with a key to increased efficiency for engines of the future.

The **FURSO-ACTION** principle involves a larger thread size and an exclusive seating arrangement without gaskets. Thus, these new Champions can be installed only in ultramodern engines designed to use them.

Your present car will continue to give you peak performance with regular Champions.

With the new TURBO-ACTION Spark Plug, Champion once again demonstrates the leadership which makes Champions the first choice of motorists everywhere.

CHAMPION SPARE PLUG COMPANY, TOLEDO 1, ONIO



By George H. Waitz Jr.

DAINTING your house will be easier than ever this spring-if you get the right paint. But it's gomg to be harder than ever to pick out the right stuff.

Back when you helped your father redo the family homestead paint was paint. One kind looked. smelled, was applied and eventually dried much like another Things are different now. Besides father oil paints and the postwar rubber latex paints, you have to choose from a new set of concoctions. It'll pay you to know about them.

There are water paints you can use outside. (You clean your brushes under the faucet and use the garden hose to get spatters off the shrubbery 1

There are finishes so tough they vithstand even attacks from the neighbors' kids

There are paints that dry so fast you start the second coat as soon as you finish putting on the first

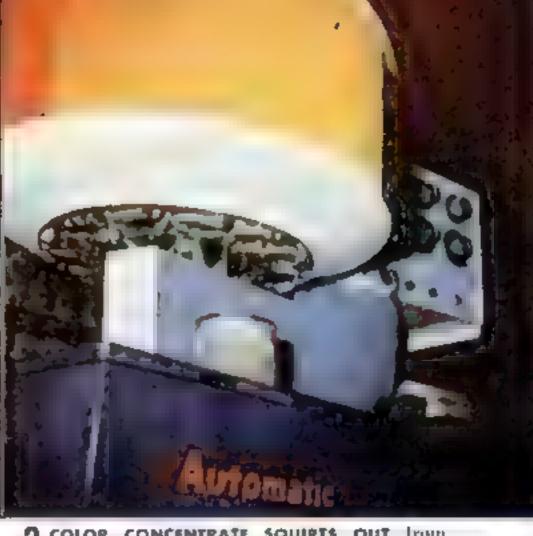
There are colors in glittering confusion, a rainbow-plus to delight the semipro decorator you married and maybe even match her favor ite drapes.

No single product can do all these things. There are several types, all available under a variety

FEBRUARY 1955 99



1 DIAL THE COLOR and machine does the rest.
With the Color Carousel, clerk mixes paint to
order simply by setting dials to code corresponding to color chip customer has picked out.



2 color concentrate squirts out from battery of Links in drain at top of Caronsel Tank is positioned infomatically by setting of dials. New model will create 6:000 shades



3 ANOTHER SQUIRT of another color is added to the can of paint. Amount of color is controlled by draft and by height of can which trips buttons to signal pint, quart or gallon.



4 PERFECT MATCH is shown by test strip after can is shaken on vibrator chackground Color Caronsel is made by Standard-Toch Chemicals, Staten Island, NY, for its paints,

of trade names. The trade names are to put it kindly, confusing. For example, two brands of the new pairts use rabber" in their trade names wet neither is a rubber latex paint and each is retually an entirely different type of paint from

the other. To get the right stoff you have to read the fine print on the label and find out what is act ally made the can

Finyl is a censin to the taigh plastic used for uphalstery and fiver tiles, but this stuff comes thosed with water reads

HERE'S	EMULSION FINISHES			SOLVENT FINISHES		
NEW PAINTS	Rubber	Vinyl	Rubber Vinyl	Acrylic	Alkyd	Oil
EXTERIOR	No	Most	No	Some	No	Most
INTERIOR	Yes	Some	Yes	Most	Yes	Some
THIN WITH	Water	Water (Unless cam label specifies special reducer)	Water	Water	Mineral spirits, turpentine or odorless sol- vent if paint is odorless type	Mineral spirits, turpentine of adoriess sol- vent if paint is odoriess type
CLEAN UP WITH	Water	Water	Water	Water	Mineral spirits, turpentine or odorless sol- vent	Mineral spirits turpentine of odoriess sol- vent
DRYING TIME Time between coats)	3 - 4 Hours	2 Hours	2 Hours	1 - 2 Hours	Overnight	Exterior: 2 - 3 Days Interior: 8 Hours

for you to brush, roll or spray on. The label on the can may say vinyl, vinyl emulsion, polyvinyl acetate or PVA.

You can use vinvl on almost any exterior except previously painted wood. It works fine on wood shingles and shakes, asbestos shingles, brick, stucco, concrete and masonry blocks. One manufacturer, Devoe & Raynolds, says you can even put it on wood clapboard if the clapboard is new and unprimed.

The big thing about vinyl is the thinner—water. You get all the advantages of easy cleanup that have made interior water paints so popular.

Suppose it rains while vou're working? Vinyl paint dries fast—as quickly as 10 to 30 minutes—and will withstand a shower after that time. It takes another 12 hours to "cure." by then forming an exceptionally

tough, long-lasting film that stands up well against weather, sun, salt air and factory smoke.

One precaution: You can't paint with it in cold weather. The chemical reaction that transforms the water solution into a durable finish will not take place if the temperature is below 50. (Conventional oil paints don't stick well in cold weather, either.)

Some manufacturers recommend their vinyl paints for interior as well as exterior use; others say no, not so good. One company expects to market soon a vinyl made specifically for interiors.

Definitely good inside the house is a new vinyl primer-sealer (Du Pont) to be used as a base coat under any paint. It dries in as little as 30 minutes. You can put it around a room and probably follow immediately with the finish coat.

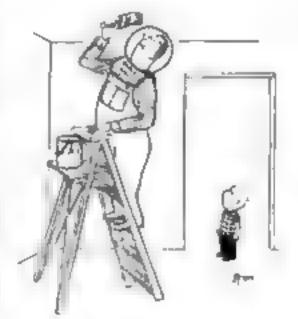
> It can be applied with brush or roller.

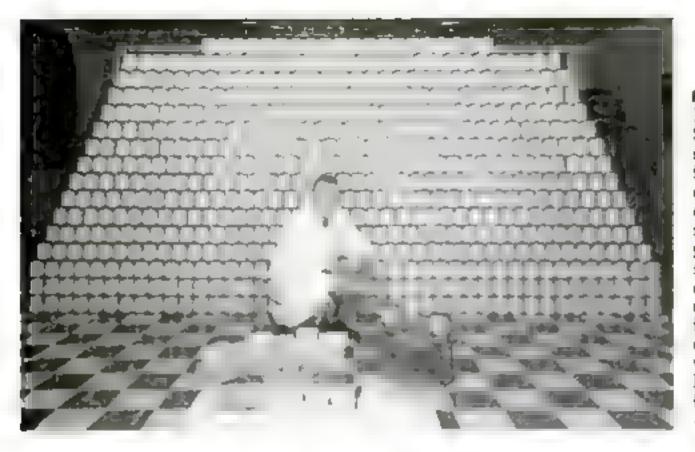
> Acrylic is the second new name for magic in paints. This is also a plastic-in-water (the solid stuff you know as the beautiful, glasslike Plexiglas and Lucite).

> Inside the house is where acrylic shines. It dries faster than other types, and it keeps its color better, without yellowing. Says one

major producer: "It combines more of the qualities demanded by both amateur and master painter than any flat wall finish ever tested in our laboratory." One disadvantage: It costs more.

Some acrylics are also recommended for exteriors (over the same kinds of materials as vinyl paints). Here it has a big edge—you don't have to pick your painting weather so carefully. It can be





HOW 90 EQUALS 572. Du Pont chemist Charlie Shay poses with the 90 small color tubes (in front of him) that can create the 572 different colors in paint cans arrayed behind him. The paint comes in neutral shade; you (or the paint dealer) add one or more color tubes to tint it. This gives wide color range, also permits various base paints—alkyd gloss, semigloss and flat, even rubber-latex —to be color-matched.

applied on humid days and in cold seasons, so long as the temperature is a few degrees above freezing.

Alkyd is an old interior paint made newly popular by a change in solvent a super-refined petroleum chemical that has almost no odor. It is not a water paint. You thin it and clean brushes with turps, or, if you want to retain the odorless feature, with the new odorless solvent. (Ask the paint-store man for just that, odorless solvent.)

Alkyd has solid claims to fame overriding the slight cleanup inconvenience. It is exceptionally tough and very resistant to scrubbing. It stands up well in the trouble spots—trim, bathroom, kitchen. And it is easy to apply, producing a smooth, even finish free of streaks and brush marks.

The alkyds have little odor, but don't forget that the solvent is a petroleum product and its vapor is there even if you can't smell it. It can make you sick and it burns very easily, like the vapor of older paint solvents. So play safe: Keep windows open and keep flames away.

The old reliables are not to be overlooked either. Conventional oil paints can now be had in a deodorized version, made with the same low-smell solvent used in the alkyds, And oil paint has much in its favor: It is sold everywhere; its virtues and faults are well established through centuries of use; it makes a tough film on almost any surface; it offers the greatest color range; and it is often cheaper.

Water-thinned rubber-latex paint is already an old reliable, though it is only about 10 years old. It accounts for a big percentage of all paint sold and is still the most widely available of the easy-to-use finishes. One new type is a combination vinyl-rubber paint (Sapolin) that is said to do a better job on interiors than either vinyl or rubber alone. It dries faster, lasts longer and has less sheen, says Sapolin.

Color. The paint makers are out to sell your wife, and color is their gimmick. They are tempting her with a kaleidoscope's variety—by year's end one firm will offer more than 6,000 different shades.

"color system," a fat book of color chips with instructions for duplicating each chip. This is accomplished by intermixing cans of colored paint, by adding a concentrated color to a can of colored paint, or by adding concentrated color or colors to a can of neutral "base" paint And for those who don't want any guesswork there's the Color Carousel (shown in the photos on page 100) that mixes the paints right in the store. Whatever the method, the result is a range of colors such as no amateur painter has seen.

So get out your painter's hat and limber up your roller arm. A good paint job is easier than ever.

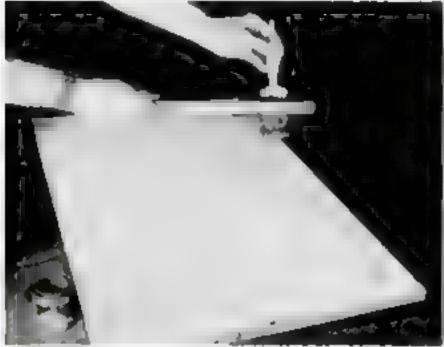




WHAT RESIN SEALER DOES to fir plywood is vividly shown above. The bottom half of the panel was not sealed, and the grain glares through the stain. The upper—sealed—half shows a subdued, attractive grain pattern.



JEWEL-TONE STAIN requires a special scaler made just for use with it. The scaler is thinned, brushed on and allowed to set for 10 minutes. Then it is scraped off (above) and the wood is wiped clean with a cloth.



FOR SPATTER FINISM you fleck painted plywood with drops of paint from a brush or Flit gun. Hitting the brush with the stick, as above, will give comparatively large drops. Use drops of several colors for best results.



FINER SPATTER is created by hitting stick with brush (above), or by thinning paint. Fine spatter here was put on top of large drops, for variety. This finish, now popular for almost everything, gives attractive "depth" effect.

plywood and get colorful, rich results.

You can paint it a couple of different ways. You can stain it with wax, glaze, oil, or jewel tone to achieve not only the familiar furniture shades but also new and striking color effects. You can even dye it any shade in the rainbow.

There are two tricks to quieting the noisy grain. One is obvious: plenty of fine sandpaper and plenty of elbow grease. Sand often but gently. Even a new, seemingly smooth sheet of plywood needs a going-over, Always finish with light, wet sanding. The other trick is resin sealer, required under most but not all finishes. The clear sealer greatly subdues the grain. The pigmented sealer can hide it completely.

Paint-applied the right way-will cov-

er up fir plywood's grain to make a smooth finish that gives no hint of the mexpensive wood underneath.

For a solid color, put on resin sealer with sprayer, brush or rag. After a few minutes, use a cloth to wipe off any that is not absorbed. Let dry at least six hours and sand lightly with 6/0 sandpaper. Then give it two coats of enamel.

Parchment is a restrained two-tone finish that is especially effective on fir plywood. You start with a good plant paint job. Then you need a slightly darker hue of the same color paint—you can simply add a little black to the paint you used for the first coat. Thin it with turpentine and linseed oil, then flow it freely over the painted surface, spreading it with a rag. Get the streaked effect



PAINT BOMB provides a convenient push-button way to get a smooth paint coat on small plywood areas, such as table tops. Bombs come in many colors, but are expensive it big areas—wall paneling, for instance—must be covered



PARCHMENT EFFECT is achieved by wiping the partly dried second coat of paint. This coat should be a shade darker than first coat. Pattern of straight streaks was used here, but any dappled or stippled design can be made.

you like by wiping, dappling or stippling with a clean numpled rag.

Spatter is an old colonial style resurrected by ultramodern decorators because it is so practical—you never see dirt or scratches on it. You start again with a plain paint job, then fleck the surface with paint dots of different sizes and colors. You can do this with a Flit gun or by tapping a paintbrush on a stick. Either way, you can vary the effect by how much you thin the paint; thicker paint gives bigger drops.

For the best results, spatter with at least three different colors. Since you need comparatively little paint, this is a fine way to use up leftovers from other jobs.

Stain wax gives you a beautiful natu-

ral finish with just one coat—no sealer. You simply wipe or brush it on, rub it in after a few minutes. It will dry to a pleasant waxy glow. The off-beat colors—blue, gray, ivory or white—give better results on fir than the conventional wood shades.

Stain glases provide another easy way to get a wide variety of lovely colors that show off the wood grain to advantage.

For a blond stain glaze, use whitepigmented resin sealer. Put it on with a big brush and don't worry about how evenly you do it. After it has had a few minutes to begin to dry, wipe the plywood gently with a soft folded cloth. How soon and how vigorously you do this will determine the degree of blonding. You can wipe so that the unwanted dark grain is masked.

For a color stain glaze, you can use ready-mixed resin sealer available in several muted shades that look particularly good over fir plywood. Or you can

What to ask for:



It's the rare paint dealer who knows what you want when you order jewel-tone stain. Here are trade names and manufacturers of special products that were used to get some of the finishes described in this article.

Resin sealer: (clear, white-pigmented and colors): Rez (Monsanto Chemical Co., St. Louis 4); Firzite (U.S. Plywood Corp., 55 W. 44 St., NYC).

Stoin wax: Cabot's Stain Wax (Samuel Cabot, Inc., 141 Milk St., Boston 9)

Jewel tones: Color Grain (Adelphi Paint and Color Works, Ozone Park 17, N. Y.).

Crystal-clear varnish: Crystal Spar Varnish (Adelphi Paint and Color Works, Ozone Park 17, N. Y.),

Sandpaper: Wetordry sandpaper (Minnesota Mining & Mfg. Co., St. Paul 6, Minn.).

FINISH	SEALER COAT	MAIN COAT	SECOND COAT	PROTECTIVE COAT
PAINT	White-pigmented resin sealer	Brush or spray on paint or enamel	Same as main coat	None
SPATTER	White-pigmented resin sealer	Brush or spray on paint or enamel	Spatter on con- trasting colors	Kone
PARCHMENT	White-pigmented resin sealer	Brush or spray on paint or ename!	Apply second color; wipe with cloth	Clear varnish (optional)
STAIN WAX	Clear resin sealer under dark wood colors only	Apply with brush or cloth, wipe after 10 minutes	None	Stain wax, netural (optional)
STAIN GLAZE	Clear resin sealer under dark wood colors only	Apply with brush or cloth; wipe if lighter effect is wanted	None, unless darker tone is wanted	Varnish, wax, white shellad or clear lacquer
OIL STAIN	Clear resin sealer	Apply with brush or cloth; wipe if light- er effect is wanted	Kone	Varoish, wax, white shellac or clear lacquer
JEWEL TONES	Special undercoater made for this product	Apply generously with cloth or brush; wipe in straight	None	Crystal-clear varnish
DYE	Нопе	Dissolve dye in warm water; apply with brush or cloth	Seal with white shellac; sand lightly	Lacquer, shellac or flat varnish

mix your own colors by adding ordinary color-in-oil to the white-pigmented resin sealer. Either kind should be applied over a first coat of clear resin sealer.

Jewel tones let you put real drama on paneling or furniture. These come in brilliant colors—bright blue, red, green, purple and a glossy black. The first coat should be the sealer made especially for this product. Then apply the color generously, wait a few minutes and polish with a cloth.

Oil stains, the old reliables of wood finishing, can be used successfully on fir plywood despite the atrocious results you have probably seen all too often. The trick is resin sealer. Use the clear type, sanding after it is dry. Then stain in the conventional way.

Dyes—the ordinary fabric kind your wife buys in the dime store to change the color of her draperies—work line on wood and come in hundreds of shades.

Dissolve the dye according to instructions on the box, but vary the amount of water to get the depth of color you like. Then wipe or brush on the unsealed wood. You'll have to sand carefully after it is dry to level the grain raised by the water

Top coats. Paint finishes are tough enough to take normal wear without any additional protection, although you may want to cover the parchinent finish with a clear varnish. The grain-revealing finishes will probably need surface coats, particularly when used in areas subject to hard wear—furniture, doors or play-room paneling.

Wax, shellae, varnish and lacquer are all good, varnish being the toughest and lacquer changing the color least, (Remember that you cannot lacquer over paint!) Whatever you use, you will get the best-looking finish by applying two or more thin coats.





Trellises Add Color the Easy Way

SOME of the prettiest flowers that bloom in the spring need supports to grow on. And the supports themselves can be an asset to any house

You can make trellises shorten a tall house or heighten a low one, vary a monotonous wall, screen a window, shade the hot sun or hide the garbage cans. If you are the proud possessor of a shiny new house in a shiny new development, you will find trellises the fastest, easiest and cheapest solution to many a common annoyance. That development look? A couple of trellises will set off your home from its neighbors. No privacy? The right vines on trellises block sight but not light. No shade? A cheap arbor trellis is a quick substitute for a tree, its slats cutting much hot sun even before the vines grow up.

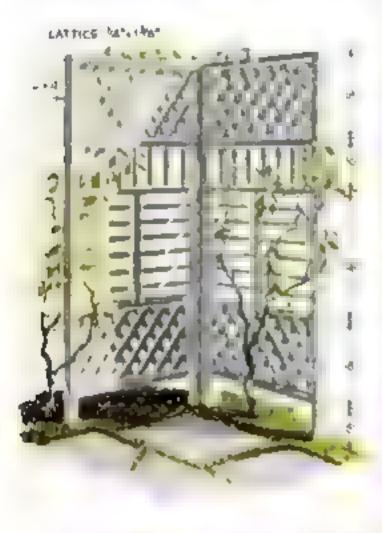
Simple trellises are easy enough for a boy to build. You can use inexpensive wood, but treat it with preservative (PSM, May '54, p. 180). Nonrusting

nails and screws (aluminum, brass or stainless steel) are best.

It is often convenient to hang light, on-the-house trellises with hooks or storm-sash hardware instead of nailing them on permanently. Makes housepainting a lot easier. Free-standing trellises, particularly if out in the open, must buck considerable wind push and need hefty posts set deep. Unless you consider it essential for strength, don't set the posts in concrete, which tends to catch water and hasten rot

You'll want a design to suit your house and your purpose. Here are 13 ideas to get you started.

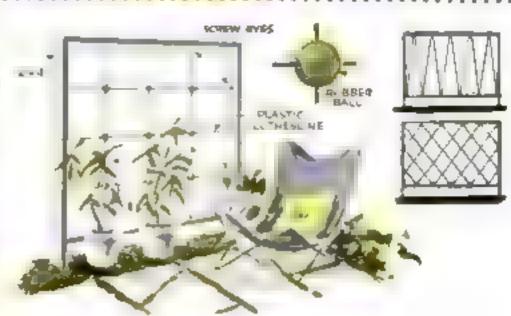
Five new designs to suit any house, new or old







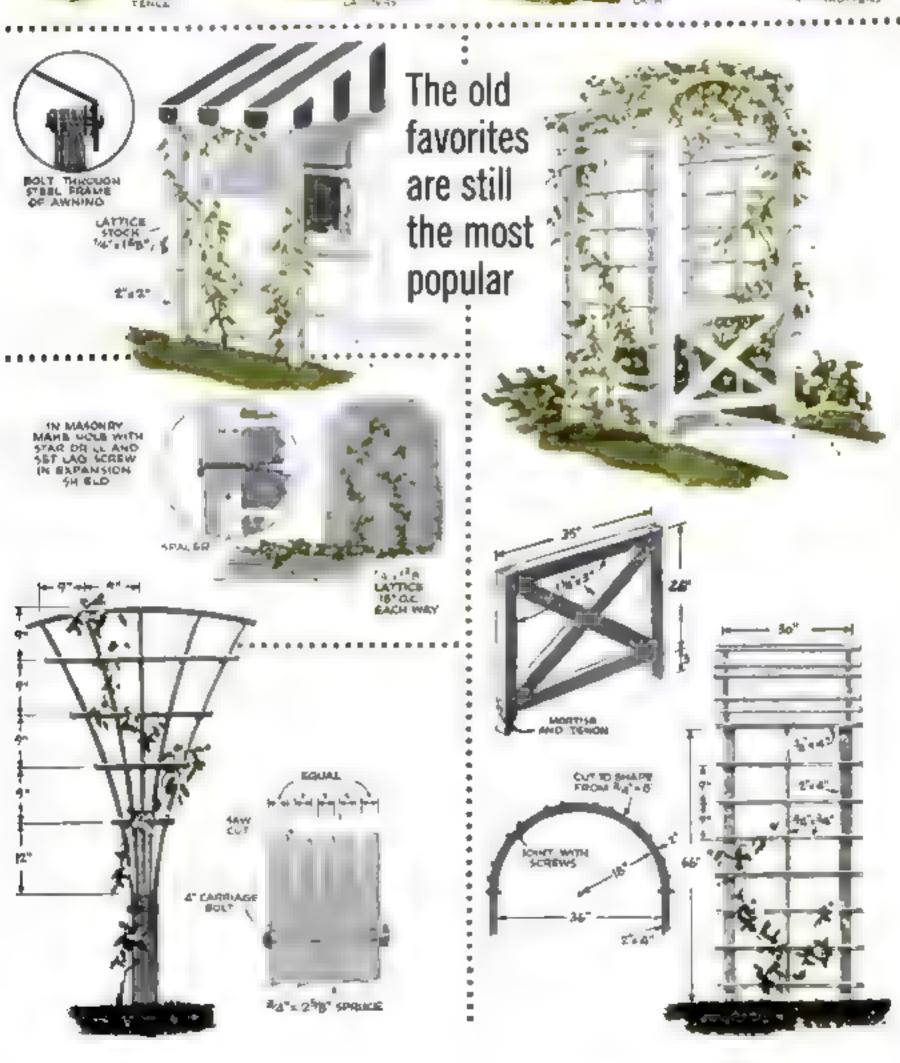




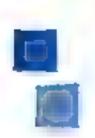
101 POPULAR SCIENCE

Four ways to make a quick-and-easy trellis









How to Install Tough

New cements now enable you to put handsome plastic laminates on your kitchen counters and furniture without special tools,

By Darrell Huff

NOW you can use those wonderful plastic laminates to top counters and tables you make or refinish yourself. Amazingly tough, they retain their bright beauty despite all normal kitchen abuse. That's why they are a favorite among housewives—and husbands—the country over.

But until recently it took a specialist to put the stuff on. New kinds of glue have changed that. You just spread the gunk, stick down the plastic and roll it with a rolling pui—no clamps or presses needed.

What's this plastic laminate? The kitchen variety is paper-plus-plastic several layers of strong paper impregnated with phenol-formaldeliyde resin, then a printed decorative sheet impregnated with melamine resin, then a top layer of melamine. This makes a rigid sheet that is usually 1/16 inch thick.

It comes in almost every imaginable color and pattern. You can buy it from building-supply houses and floor-covering shops under at least 11 different trade names, the best known of which is Formica.

Under the plastic you need a solid and smooth wooden surface. New counters should be 4-inch exterior-grade fir plywood, firmly fastened to the cabinet with barbed or screw-shank nails. To mark for the sink cutout, place the metal sink trim right-side up and trace around the outside of the foot of the trim. Drill starter holes, cut about two inches inside the mark with a keyhole saw, and then cut to the line with a coping saw.

How to cut the plastic. Tools meant for soft metal work best, but you can use wood saws if you don't mind dulling the teeth,

• For straight cuts, try a plumber's saw -a fine tooth tool that looks like a lady's-size carpenter's saw—or an ordinary crosscut with fine teeth.

 For curved cuts, you can use a hacksaw or coping saw. One of the cheap keyhole hacksaws is good for curves and will also handle short straight cuts.

Power saws-portable, table, band or µg—are excel

III POPULAR SCIENCE



Plastic Counter Tops





2 FINE-TOOTH SAW cuts the plastic panels neaths Saw should be held at a low angle to prevent chipping. Out the panels a bit wide

3 spread GUNK on the panel back and plywood subsurface. Notches in the spreader regulate the amount. Let set for 40 pointes



4 POSITION PANEL EXACTLY over sheet of wrapping paper then slip out paper press down. Be careful here coment grabs fast

5 ROLLING PIN and plenty of pressure guarantee a tight permanent bond. Note that sink has been removed final cutout left for later



6 PLASTIC OVERLAPPING counter edge is cut off with a saw if there's much with a block plane if there's little. Then file to a beyel

7 METAL TRIM covers addes and cornery You need separate types for front edge, sink run cove bead at wall and cap on back-splash strip

lent, though best with fine-tooth metal-cutting blades. Special Formica snips, which you may be able to borrow or rent, are very convenient. Ordinary tin smps can be used, but they will chip at least one

side of the material.

With any tool except a portable power saw, cut the plastic with the good side up. Grease pencil or crayon is useful for marking. To reduce chipping when you must use too coarse a blade, cover the line with cellulose tape.

How to stick it down. There are two types of cement: one sticks tight immediately, one lets you move the plastic around a bit before it sets. Use a cement suggested by the manufacturer of the plastic.

The Formica people and most other makers recommend contact-bond cement, which grabs like iron the instant the material is laid in place. Spread the contact cement outo the back of the Formica, using the special trowel supplied with it. Put on a full coat, don't work it back and forth to make it go further. Right away, spread the adhesive the same way onto the top of the counter.

Let dry for at least 40 minutes, but not more than two hours. You'll know it's properly set when a bit of wrapping paper pressed gently onto the surface and then taken up does not take any adhesive with it

Now cover the counter surface with clean wrapping paper a bit wider than the counter. This paper is a slip sheet to help you place the plastic exactly.

Put the plastic on top of the paper and make sure it is exactly in position with a little bit to spare on all sides. You can't budge it once adhesive touches adhesive. Without letting the plastic shift, lift one side and pull out the paper. Let the plastic down and press tightly with your hands,

Rolling completes the bond. Your wife's rolling pin is okay, but a narrow roller—say three inches—is better. Cover every square inch and press hard. Use a mallet

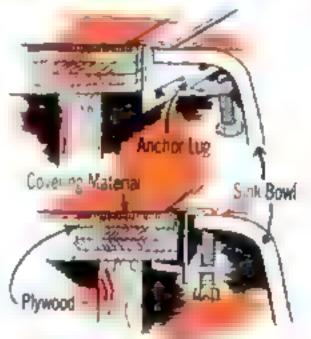
in the corners.

A back *plash-a strip of plastic covering the wall directly behind the counter-is well worth the small extra effort. It is applied after the metal cove molding that trims the counter-wall joint. You can put it directly on a paint-free, sound plaster or plasterboard wall, using the same method as that for covering the counter. If over-counter cabinets prevent your using a paper slip sheet, hold the back-splash strip at a 45-degree angle to the wall, slip the bottom edge into the cover molding, position accurately, then push it into place

You have two outs in case you goof: If you apply the adhesive but fail to lay the plastic before the cement loses its sticking power, you can reactivate it at any time within 24 hours with the heat from a heat



JOB GOES FASTER and easier if you can beg, borrow or rent special tools that the pros use. New Formics snips make cutting a snap. They remove a tiny sliver of the sheet in a sort of double cut that does not chip the material. Special router bits, carbide-tipped, and a template will trim the plastic edges perfeetly, either flush and square or at the standard 25-degree bevel. Both cutters are made by Grace Fabri-Tool Co., 1238 Chase Ave., Cincinnati 19.



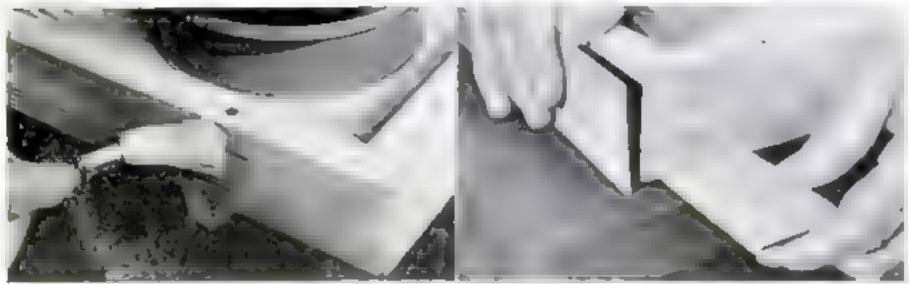
ROOF SINK EDGE is easy to get with new clamp trim like one shown above. You hang sink, which must have flat rum, on brackets supplied with trim. Then spread calking under both arms of T trim and slip it into place from above. Finally, insert lugs and tighten bolts from underneath, Trim is permanent support for sink.

How to Plastic-Top a Table

The plastic laminates are every bit as good—and good-looking—atop tables and chests as they are on counters. You can buy them in beautiful wood-grain patterns to match most furniture, and if you want to be extra fancy, you can even get a laminate made with real wood veneer. The real-wood type also comes in a cigaretteproof grade—a

layer of metal foil carries off heat so that even a burning cigarette won't harm the top.

You top furniture the same way as counters. The edges can be left alone on an old piece. On new jobs, the edges can be painted, trimmed with metal or wood molding, or—for the finest result—banded with strips of the plastic. These photos show you how.



a stiff brush 40 minutes apart. Back of plastic band gets a single coat. Let the cement set 40 minutes before sticking plastic to table. Banding works best with a fairly wide edge, made here by nailing mitered wood strips to the plywood top. Edge bands must be put on before you apply the top covering.

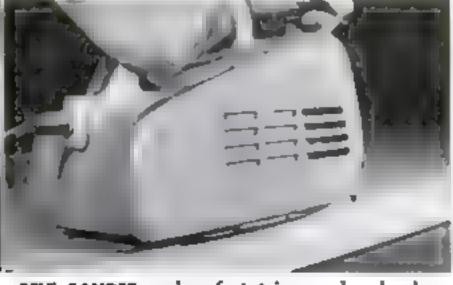
PLASTIC BAND, out 1/4 inch wider and an inch longer than needed, is stuck first to opposite edges of table. For accurate positioning, do this with table upside down on shims of plastic. Shims make band project beyond top just enough so that you can later trim it off flush. Press band on from the middle out, then hammer a wood block against it to get it on tight.



TRIM THE ENDS of the first two strips flush with the table. The remaining two strips can then be applied. Their ends are also cut off, but then beveled with a file or sandpaper. Notice the newspaper taped around the unbanded edge to keep sawdust out of the adhesive.

lamp. (Don't use a torch; the adhesive is inflammable.) If you get the plastic down but must remove it, brush lacquer thinner against the glue joint, peel back the material and apply thinner as you go.

Trimming the edges. Over the outside counter edge you put metal channel or L molding. The simplest type just screws on. A new kind gives a neater,

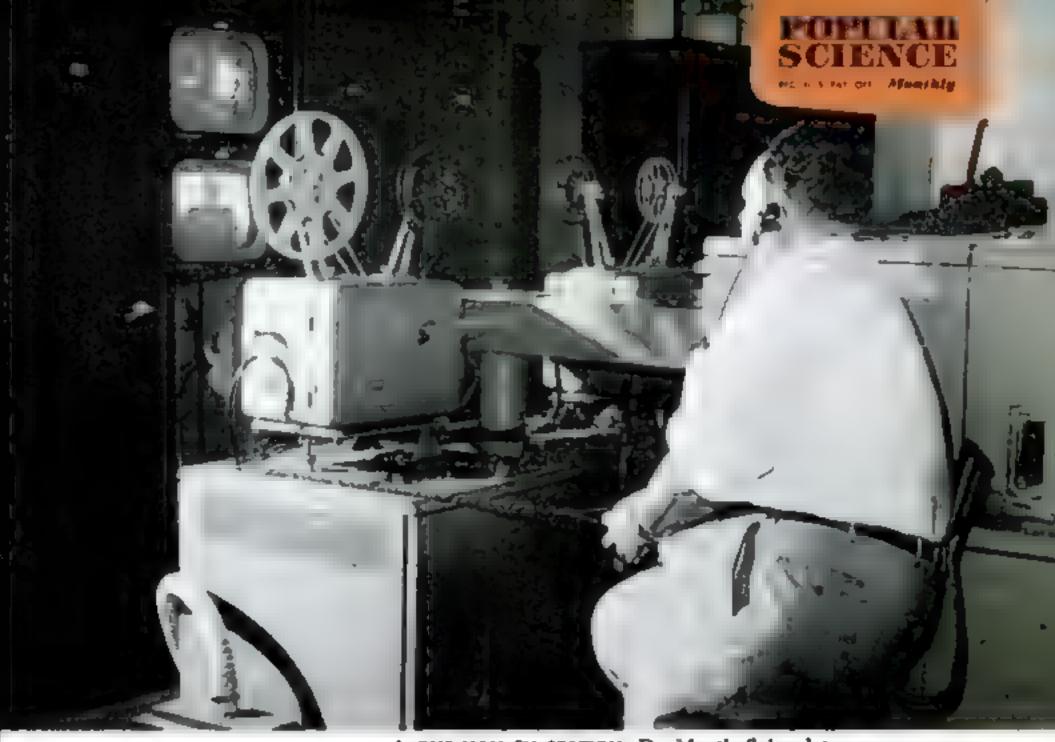


BELT SANDER makes fast trim on band edges. File, sanding block, plane or router could also be used. Top edge should be trimmed flush and square; bottom edge gets slight bevel. Table is now ready for top covering, which is applied like covering for kitchen counter.

flush surface by snapping into clips that you nail into the plywood edge. (This is Silver Streak, made by Kinkead Industries, 5860 N. Pulaski Road, Chicago 30.)

The trim inside the sink cutout is critically important, since that is where water is most likely to get at the plywood. The clamp-down type—a T shape that covers sink rim and plastic edge—is best. END

POPULAR SCIENCE



"Dragnet" (film)"



"Disneyland" (ifim)



"I Low Leey" (film)



A ONE-MAN IV STATION, Du Mont's flying-dot scanner can reproduce two movies simultaneously, one for broadcast, the other for studio preview, and insert commercials. Mirrors split intense light from the cathode-ray tube to scan films at right angles.

Why TV Is Going Movie-Mad

It is easier, safer and more profitable to put shows on film—so celluloid is becoming the darling of the air waves.

By Wesley S. Griswold

HE jokes you hear on TV tonight—and the comedian's grin, too—may be older than you think. Often the show has been staged long ago, in front of a movie camera, and far away from the station that is broadcasting it for the first time. Television stations

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beside A "FLYING SAUCER"—a 5,000 watt light with a circular battle, which diffuses a soft pervading light over a studio set—Gene Lockhart discusses a film he is making for NBC-TV.

A CRAS DOLLY CREEPS IN on a scene from His Honor, Homer Bell, a TV movie series. The screened more than twice as much movie film last year as the nation's theaters did. The CBS network alone uses more film in 12 months than all of Hollewood's studios

Thirty-eight percent of ABC's sponsored shows are on celluloid. So are 30 percent of NBC's evening programs CBS's most popular presentation, "I Love Lucy," is a filmed show. So is "Dragnet NBC's top favorite, And so is "Disney-land," ABC's new bit

Nickelodean, Faudeville-and Live TV?

Soon you may be recalling the good old days of live television as sentimentalby as any veteran theatergoer now remembers the nickelodeon and vaudeville Improvements in film, in cameras and in studio accessories are helping film makers shove the live TV shows into history

Producers often prefer to "can" their shows because it's easier on their ulcers. The sadden bedding down of a star with a virus infection can be accepted with-

camera pedestal moves up and down hydrauhealty, a crewman maneuvers the dolly itself.





"REHEARSING" A FILM SHOW consists of checking its timing, sound and picture quality a couple

of hours before string. This previewing of a "Disneyland" episode was shot with Tri-X film.

out a pang if, thanks to film, she'll be appearing on the Thursday-night show as usual.

Besides, film gives a show more scope, takes it off a limited stage and gives it the world to roam around in.

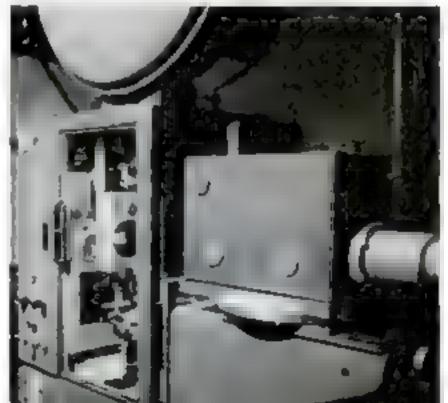
Even a lot of live shows are interlarded with film sequences, apart from the thousands of feet of commercials that have to be endured in an average week. Rearprojection shots, for instance, make live actors appear to be gazing off a studio-bound porch into anything from the Atlantic to the Grand Canyon.

Engineers prefer filmed TV shows because they are easier to handle technically

Program planners like shows on film because they are precisely tailored to air time and contain no panic-making lapses or accidents. Furthermore, film neatly solves one frequent dilemma in programming:

Suppose a TV station in Tulsa doesn't find it profitable or convenient to rebroadcast a certain live show from New York at the hour when it goes on the air,

IN THE DARK CIRCLE at center below you see a frame from a movie being projected onto the tmy end of a Vidicon tube, facing it in a camera favored for televising movies.



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A PROMISING STUNT is here staged by Du Mont, which teamed up its miniature Tel-Eye television camera with a 35-mm. movie camera. Director can see the scene as it will appear on TV.

yet the Tulsa station doesn't want to miss out on the program altogether. This calls for a kinescope—a film recording of a live show, made by aiming a special movie camera at a monitor screen while the show is under way.

The traffic in kinescopes is immense. CBS, for instance, alone sends out 2,500



"The Six Erwin Show" (Him)

16-mm. "kines" a week from its New York headquarters. Affiliated stations around the country telecast them any time they like.

Television stars usually prefer to

put their shows on film because they can do in 39 weeks (the TV year) what it otherwise would take them 52 weeks to accomplish. During the summer months, the best of their filmed shows of the previous winter and spring can be re-rur, leaving them free to accept other engagements or just take it easy

There's a money angle, too. For a live show, a star is paid just once. On the other hand, film series for TV have first, second and sometimes third and fourth runs, like regular movies, though their titles usually change with the run. The star gets a diminishing percentage of his original salary for each successive run.

"It's like an annuity," Gene Lockhart says contentedly. Lockhart, plump, elfin veteran of scores of Hollywood movies and many stage productions, has been making a million-dollar film series, "His Honor, Homer Bell," for NBC in the old Brooklyn movie studios where the Talmadge sisters, Marie Dressler and Fatty Arbuckle started out

Lockhart says that making movies for television is harder than making them for theaters. The script is devoured in gulps rather than nibbles. This puts a heavier strain on actors' memories. Homer Bell's adventures, for instance, are being filmed at the rate of nine to 11 minutes of screening time a day. Hollywood thinks it is lucky to complete 1% minutes of a feature a day.

New Techniques Step Up the Pace

As a result of this accelerated tempo, a half-hour film for TV is routinely turned out in a week. Hollywood ordinarily takes a lumbering three or four weeks to shoot a half-hour segment of a full-length, hour-and-a-half feature picture

The stepped-up speed of film making is partly due to the increased mobility of the camera. It usually rides on a "crab" dolly, which crawls on four pairs of rubber-tired wheels that turn simultaneously in any desired direction. Hollywood's cameras, more often than not, travel on tracks, which have to be picked up and relaid for nearly every scene—a heavy-footed, time-consuming routine.

Lights and microphones for making TV films are almost always overhead,

their treacherous trailing cords out of the way. So, freed of obstructions and unencumbered by tracks, a camera on a crab dolly is practically as agile as a circus



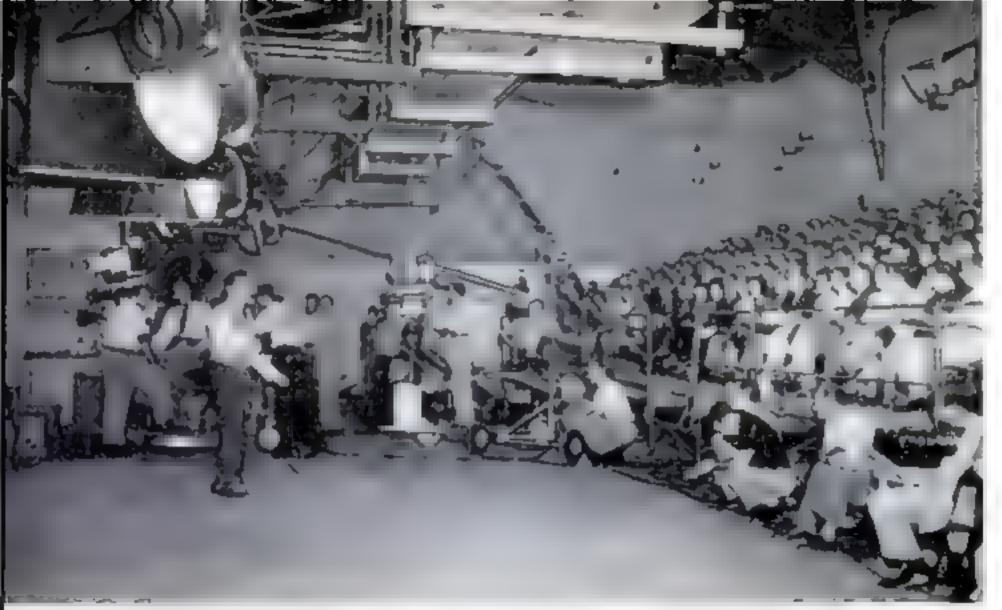
"The Ray Milland Shew" (film)

Du Mont hopes to streamline movie making still further with a rig that joins a movie camera and a closed-circuit baby

horse, gliding smoothly to new positions.

TV camera on one dolly. With this, a director could at all times see just what his cameraman was up to and not have to wait for hours to see the day's "rushes."

The emergence of Eastman Kodak's



for the "feel" of Live Tv, "I Love Lucy" (above) and other popular shows are filmed

before an audience, whose reactions keep actors keyed up and are recorded as well.

new superfast Tri-X film was a boon to TV movie makers, With Tri-X, good pictures can be taken with an average of 50 to 55 foot-candles of illumination on the set instead of the 500 previously required. Sun effects can be obtained with "deuces" (2,000-watt spotlights) where 10,000- or 12,000-watt arcs were needed before. The cameraman can get along with smaller or fewer lights and thus save his boss money, or—and this is much more important-he can use the same light that slower films require and stop down the diaphragm of his camera. This distinctly improves the camera's depth of focus and does much to increase the three-dimensional effect of a scene on the television screen.

Clarity Begins at Home

The swing to film on TV has been speeded by the development of cameras ideally suited to transmitting movies to the home audiences.

A greatly improved version of RCA's midget Vidicon camera (PSM, May '50, p. 119), with a scanning tube smaller than a flashlight, makes it possible to reproduce film on TV with far greater

clarity and truer shading than has been possible with that tired old workhorse, the iconoscope. Comparable results are obtained with the flying-dot scanner, which both Du Mont and Phileo manu-

facture in slightly differing versions.

Lastmonth. NBC began field-testing a device that may make the live TV show almost obsolete—sight-and-sound recording on



"You But Your Life" (film)

magnetic tape. When tape recorders for TV are perfected, there will scarcely be any point in telecasting a show live, Why risk mistakes? The dress rehearsal can be put on tape, which is instantly ready to play back. Bloopers can be cut out, overly long sequences snipped, the best camera shots retained and the carefully edited production, tailored perfectly to time limitations, will be ready for airing in far less time than it now takes to develop and print film. Besides, when this show has served its purpose, the tape can be wiped off electronically and used over and over again. END



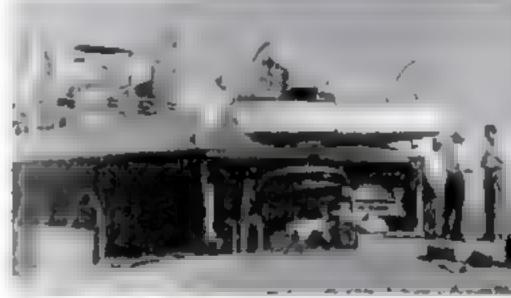
Private Television Brings Church Service to Overflow Crowd

WHEN Dr Norman Vincent Peale preaches in New York's Marble Collegiate Church, only 1,100 worshipers can crowd into the pews. But a TV camera in the rear gallery (above) brings the service to 700

more people watching four receivers in a chapel, an auditorium and two clubrooms. The TV set-up is operated by technicians who are also members of the congregation. Installed by Du Mont, it cost around \$25,000.



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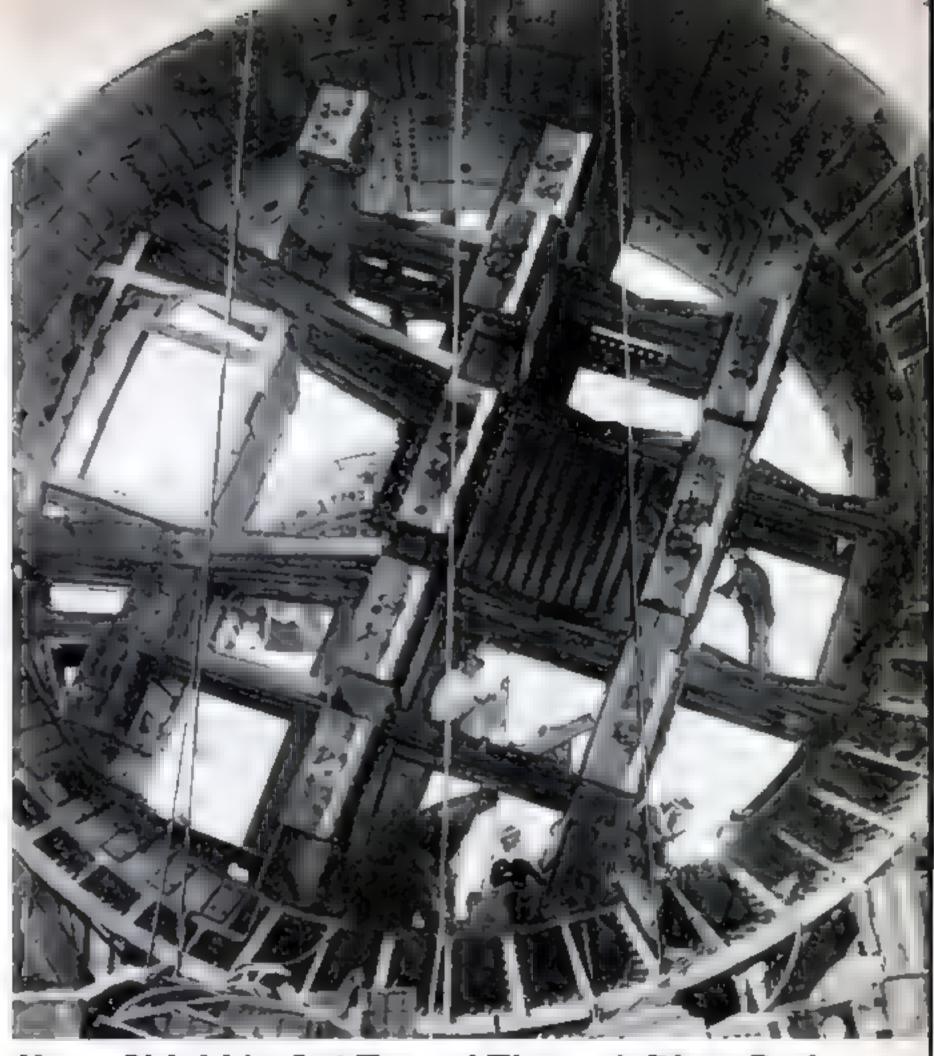


Ferry Lets You Drive to Cuba

Coing to Cuba? This converted landing ship will ferry you and your car from Kev West, Fla., to Cardenas, Cuba. You walk aboard and a crewman backs your empty car into the hold. Contrary to Army practice, the 225-foot remodeled LSM loads at the opened stern.

One Push Opens Up This World

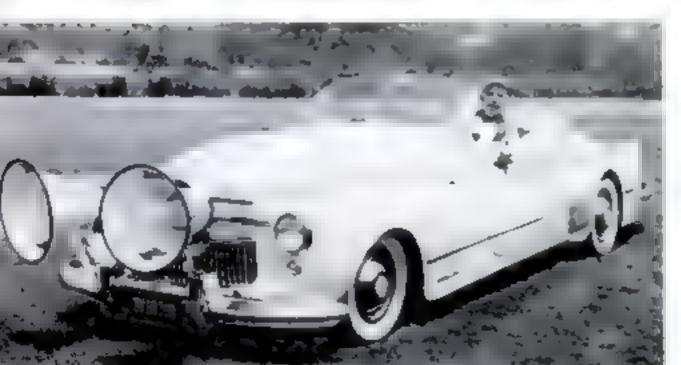
CHARLES E. RIDDIFORD of the National Geographic Society, Washington, D.C., has invented a cheap collapsible globe that opens like an umbrella, then pulls down over the shaft, or axis, to form a sphere.



Huge Shield to Cut Tunnel Through River Bed

The tunnel state being set up above will been a true to be under the Hodson layer for the Lincoln Tunnel connecting

New York and New Jersey Propelles by 28 hydraulic tacks at will out a rough rock and silt of the river bed



Announcer's Car Carries His Voice, Too

Taxover the two speak ers on this \$35,000 car. Leon Wilson's voice booms out over 100 acres to describe California parades and athletic events to spectators.

FEBRUARY 955 [2]

"How I Fly



J. F. ("Skeets") Coleman is the first man in history to fly an airplane straight up from the earth, deliberately land it straight down on its endgate, and live to tell the tale—which appears below.

As engineering test pilot for the Navy's XFY-1 VTO (vertical take-off) fighter, built by the Convair Division of General Dynamics Corp. at San Diego, Calif., this ex-Marine combat fiber has made more than 350 successful flights in the radical new plane. Now 36, he has logged 4,500 air hours, including 100 hours in helicopters.

Skeets got his first taste of flying in the Civilian Pilot Training Program at the University of lowa. He soloed a Cub in 1939, By 1942 he was a Marine shavetail Four years and 91 South Pacific combat missions later, during which he earned the Air Medal and Distinguished Flying Cross, Coleman came home a lieutenant colonel.

By Skeets Coleman

JUST before the war, I used to put-put over Iowa farms, concentrating on flying a 45-horsepower Cub straight and level, Today I fly straight up from a Navy field in California in the first conventional airplane ever to rise vertically from take-off. The Navy calls this sensational new plane XFY-1, but you may know it as Pogo.

Its jet-prop engine is the most powerful ever built for a fighter-weight flying machine. After leaping straight up from the earth, Pogo moves easily through what we call "transition" into level flight. On landing, it comes to rest on its broad tail.

By carefully coordinating engine power and the plane's attitude, I can hover-motionless—like a helicopter, rise gently as a whisper or faster than a jet interceptor, or streak like a scared rabbit across the heavens.

To change power, I move a lever that alters fuel flow and the bite of the contrarotating turboelectric steel props. The engine runs at constant speed.

Pogo's cockpit, except for the seat, resembles that of any experimental interceptor. You'd find the usual array of

test instruments, scores of them, plus a few that show at a glance how fast Pogo climbs and descends. That's very important, especially near the ground.

As I climb in, I ease into the seat, I he down, much as you might in a lounge chair. Actually, the back is about 30 degrees above horizontal. Getting buckled in is the toughest part of the flight. Try putting on your suspenders while lying on your back. I check the controls, and ground workers roll the ladder away.

Pogo Goes Up Like an Elevator

Jet pilots know that you can start the fire and take off, without waiting for the engine to warm up. But I've got too many piston-engine hours under my belt to take off "cold." So I wait a half-minute, open the engine to two-thirds of its rated 5,850 pounds of thrust (equivalent to 5,850 horsepower), and start going up like an elevator.

Right now my cockpit cover is open, because during the first 150 feet of climb I must be ready to look down over my left shoulder. That's necessary both to orient myself and gauge my altitude Once we considered putting in a rearview mirror to watch the ground on take-

the Pogo Plane"

In rapid-fire order he (a) manufactured a gummick that turns off radio commercials, (b) earned a BS degree at UCLA in 1947, (c) took graduate work in psychology, (d) studied aeronautical engineering, (e) operated a flying school in Cahfornta, (f) got married, and (g) latched onto a job at Convair in 1951 as a test pilot. With his wife, Lee, and two-year-old daughter, Nancy Lee, he lives in Del Mar, at the northern tip of San Diego.

Coleman's current job is to wring out the prototype Pogo and discover how less experienced pilots can learn to fly this advanced plane. When that's done, he hopes to have more time for golf and tenms again, because he's gained 10 pounds while flying Pogo. He figures a fellow who is carrying 170 pounds on a 5-foot-9% frame needs more exercise than reining 5,850 horses around the sky can provide.—Andrew R. Boone.







POGO BACKS DOWN onto four tail casters when pilot gently cuts power on propellers to just less than the plane's weight.

off and landing. We'd thought some of trying a periscope and ground-glass screen. I vetoed both, because I wanted to avoid anything that might make it more difficult for other pilots to learn by instruction what I'm learning the hard way.

That first 150 feet is the toughest, both going up and coming down. That's the line above which I can explode myself out of the cockpit and land safely by parachute, and below which odds aren't

so good.

When flying vertically, the plane literally hangs on the props. At 200 feet I'm ready for the transition into horizontal flight, when the wings will take over. In a pinch, Pogo can change over at 50 feet, but that's more risky.

Stick Straightens Pago Out

Things happen fast, I push the stick forward, nosing Pogo over. At the same time I ease the seat backwards so I'll be sitting comfortably instead of leaning forward. The hatch closes automatically.

Nosing Pogo over is like driving your car over the crest of a hill. I go from vertical to horizontal exactly as a pilot dives any airplane from horizontal, by

shoving the stick forward,

Landing is different. Say I'm cruising at 260 knots. If I should pull the stick back, I'd climb several thousand feet; Pogo, having a small wing and tremendous power, is a high-speed plane. I make a normal approach until I'm down to about 50 feet. There I start jockeying the throttle, at the same time pulling the nose higher and higher. Slowly I pull Pogo into a nose-up attitude. I can stop anywhere during this change, If I undershoot my landing spot, I can creep in at five knots.

Over my left shoulder I see the concrete apron. For a moment, I hang motionless. I move the throttle a fraction, taking off 100 pounds of thrust. Ever try to back your ear into the garage with only inches to spare along the walls? With experience, I've learned to back Pogo down without scratching walls that might be there. It's a gentle, precise



"Nosing Pogo over," its pilot "is like driving your

maneuver. Where airliners settle for landing at 500 feet a minute, Pogo descends at only 300, nice and comfortable,

When the casters are only two feet off, I hit the throttle slightly, and I hit it again at one foot. Then I let it go, At ground idle, the engine adds slight negative buoyancy. That helps the plane to stand sturdily, even in a 20-knot wind.

Pogo isn't a plane that you get in and fly away. When I learned two years ago that something of this sort was projected, I buttonholed Sam Shannon, Convair's chief of experimental flight at San Diego. "Sam," I said, "I'd like to test Pogo."

I told him I was peculiarly qualified and I hope I accented the right word. I had had considerable experience in both Navy and Marines in carrier landing, and I was a jet-qualified pilot.

Two months later Sam gave me the nod, and some good advice: "Do what-

ever you can to get the feel."

A Dry Run-on Jacks

Day after day I sat in a full-size wood mock-up of Pogo, fingering controls, studying instruments, adjusting and readjusting the scat. The mock-up was rigged to move between vertical and horizontal on hydraulic jacks. I plotted my cone of vision, to make certain exactly how much I could see down over my shoulder.

I observed models free-flying in a wind tunnel at Langley Field, Va. Back in San Diego I climbed into a test-stand cockpit. Repeatedly I "flew" a duplicate of the engine in Pogo. The engine could rise only five feet, but it gave me experience in judging how much power



writes in this article, car over the crest of a hill."

I needed to rise, hover and settle down again.

For the delicate feel, I began to fly helicopters, Early helicopter flights gave me an eerie feeling. I wanted horizontal speed to support the wings. Gradually, though, I became accustomed to leaping vertically off the ground.

Pogo Climbs Out of the Barrel

The day I first took Pogo up, last June 2, I flew "in a barrel"—a big Navy hangar at Moffett Field, Cahf. A pair of cables hooked to the nose would catch me should the engine fail. On August 1—280 tethered flights later—I rose from Moffett in history's first vertical free flight. It was September 3 when I put the plane for the first time through the complete flight cycle

Often I am asked: "Is Pogo really

good for anything?"

Well, how about flying them as fighters from the decks of merchantmen and Navy ships to protect convoys and the fleet? They could come home to roost and re-arm. Or dispersing many of these powerful slingshots on farms, or deep within woods, to leap upward when an alarm sounds? Perhaps the day will come when you will fly straight up in a Pogotype airliner. This may solve the problem of operating from cramped airports in the middle of cities

Figuring out jobs for Pogo is mostly other people's problem. Right now I've got my hands full learning to fly a machine that's both the world's slowest and fastest propellered airplane. Once I give it full throttle, I figure Pogo and I will nudge the speed of sound.







GOING UP. Pogo hangs on two 16-foot, three-bladed props spun in opposite directions by 5,850-hp. Allison gas turbine. Wings help only as it eases into level flight at 200 feet.

'55 Appliances Make KP Easier

Electric kitchen center combines five appliances—stove, sink, dishwasher, clothes washer-dryer and garbage disposer—into a single unit. A one-piece stainless-steel counter top 8% feet long covers it. Plumbing and wiring for individual machines are interconnected so that a single hookup installs the whole unit. General Electric sells the works for about \$1,500.



A full-width over-30 inches—makes space for two separate broders in this Westinghouse range. The cook can brod six or eight steaks to order, some well done, some medium rare, and serve them all up hot at the same time. On the top, an automatic electronic unit cuts off the current if a pot boils dry.

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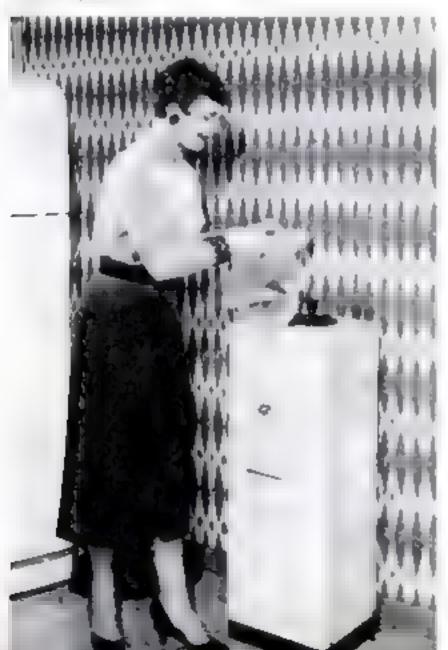
Cold-drink dispenser automatically mixes concentrated fruit juices with water from two-quart tank in this Westinghouse refrigerator-freezer, which sells for \$550.

Wall refrigerator by GE hangs from a bracket screwed to studs. Its shallow shelves put all food within easy reach. There's eight cubic feet of ordinary refrigerator storage and a freezer section (shown open) holding 73 pounds. Price: \$600-\$800.





Home water cooler for kitchen or recreation room fits into any small spot that's handy since it needs no plumbing. Water is poured into a gallon reservoir under the lid and waste water drains off into a tank that lifts out at the front. For the many Western families who buy bottled drinking water the standard five-gallon jug of spring water fits into the top. A push button low enough for a child's reach turns on the tap. Westinghouse calls it a Cooleret and sells it for about \$150.





New Wire Shrinks Motors

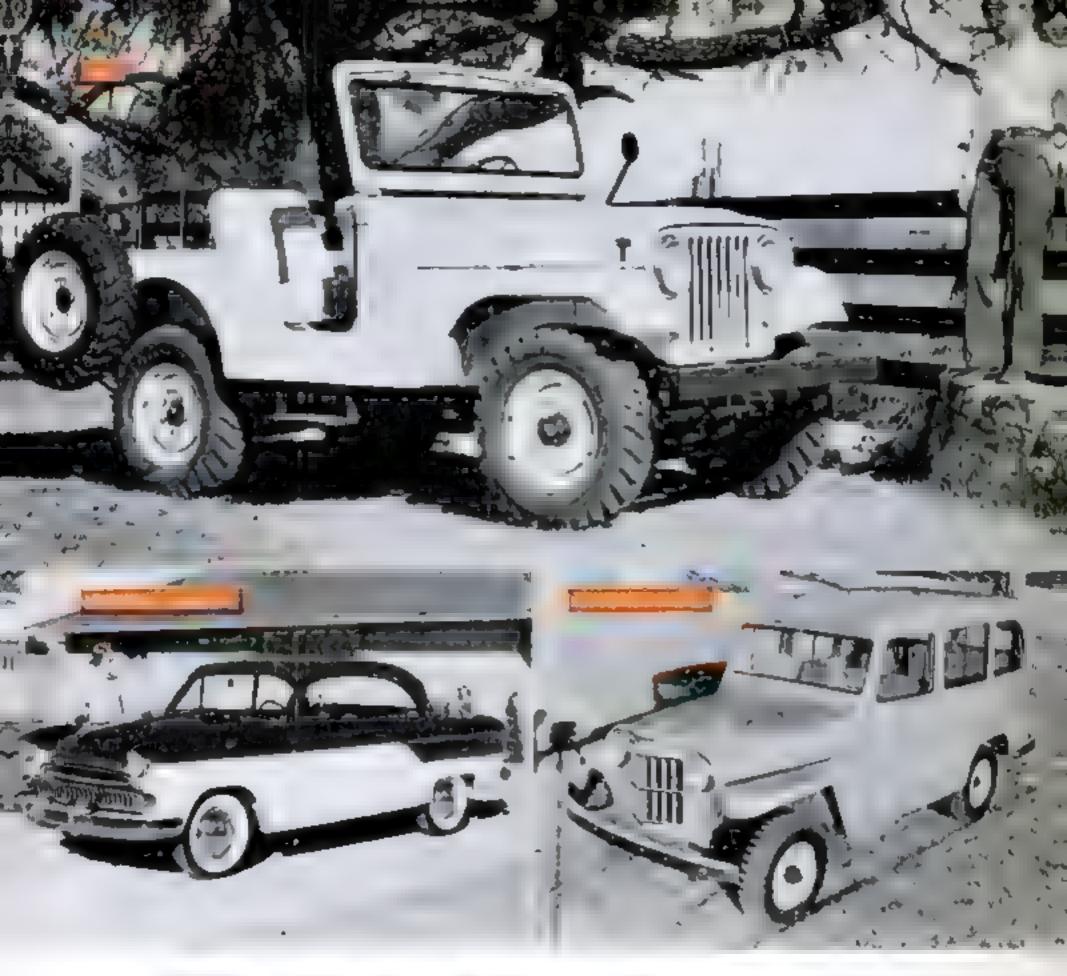
SMALLER motors for tools and appliances are promised by a new type of insulation for the wire winding. It is very thin but withstands considerable heat. By using this Alkanex wire, a 20-horse-power motor could be upgraded to do the job of a 25-horsepower model. General Electric developed it.



Hitching Post Warms Engine

A MAN without a garage in Solna, Sweden, can park in the street without worrying about cold-weather starting. He just plugs into a curbside electrical outlet that runs a special heater fixed under the car's hood. Cost: \$20 a year.





Willys Chops Prices, Pushes Jeep

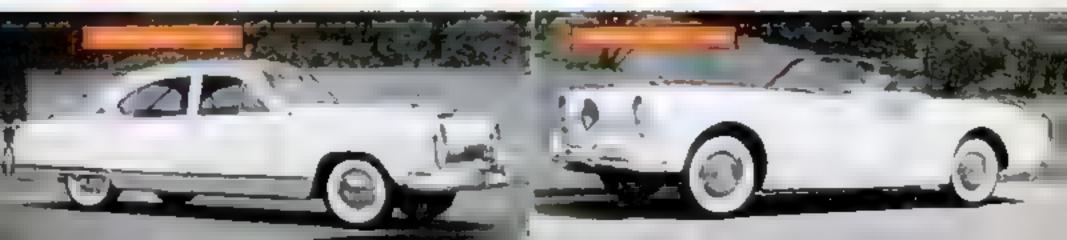
KAISER WILLYS List month slashed away in two directions real rengits in the er of passenger-car models for 55 from 10 to three and cutting prices.

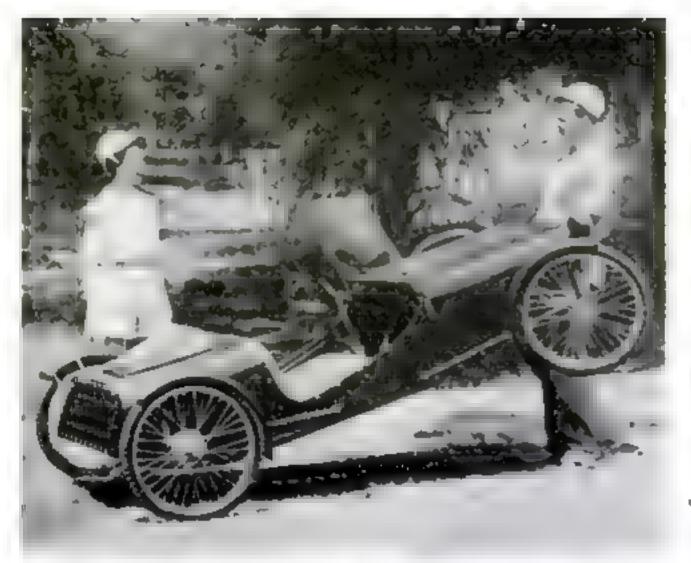
Amounting its new vehicles the company said it was limiting passenger types to the Kaiser Manhattan, the two-toned Willys hardtop and the Acc foor door sedan. The Henry J is being dropped

Retail price on the hardtop at the

factors. Federal fax meladed was fixed at \$1.795 down \$400. That on the sedan is \$1.725 down \$300. Prices on the Kaser the Danial sports car and the station wagon—none of them changed materially from '54—are the same

Willys was proudest of its new fourwheel-drive Jeep, with a wheelbase up one eich to 81 and an over-all length boosted 2% niches to 1314





Plastic Car Has Rear Engine of Only Five Hp.

JIM ROOT, a Kansas City automobile engineer, has built a car that can go 60 miles an hour—on only five horsepower.

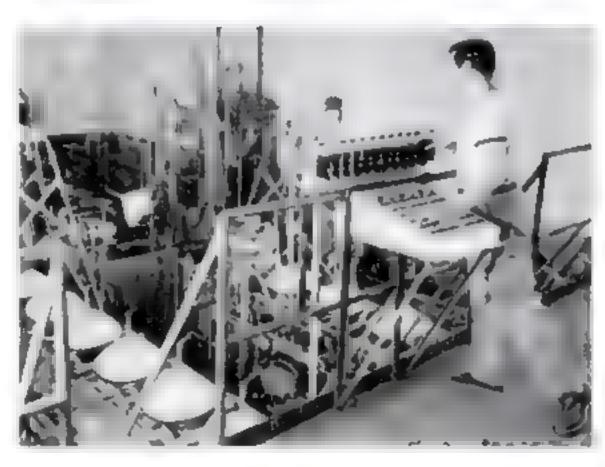
It's a cross between an automobile and a motor bike The wheels were salvaged from a motorcycle. The body is made of plastic. A tiny compartment behind the seat houses the engine. Root calls his car the "Rootster."

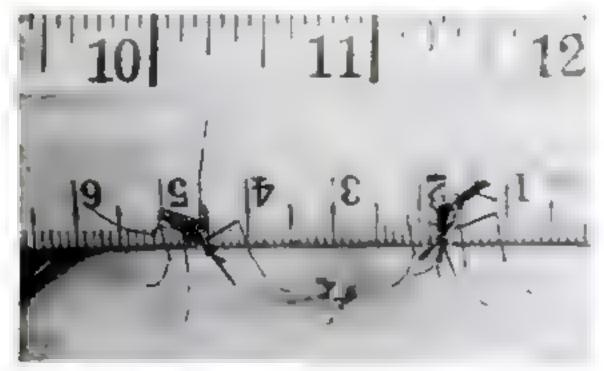
Weighing only 200 pounds, its cruising speed is 35.

TV Tubes Are Moved by Push Button

As TELEVISION picture tubes get bigger and heavier, they are harder to handle in manufacture. So one company does it by push button—a workman at a control console throws a switch, and mechanical arms move the tubes along the production line.

Shown here is a part of the Sylvania factory at Seneca Falls, N. Y. The arms, capable of lifting 500 pounds, seize the fragile tubes by suction.





Super Skeeters Bred to Kill Little Ones

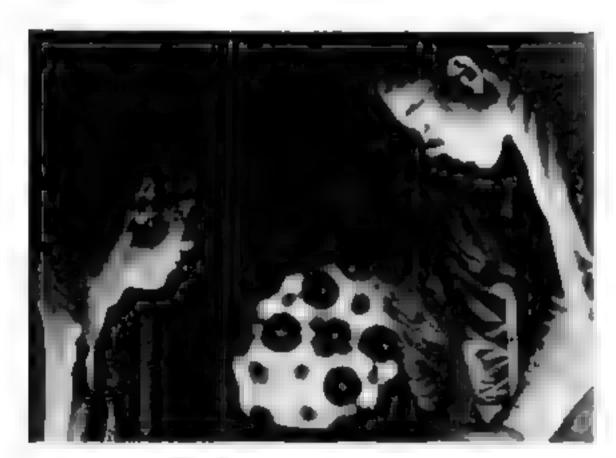
In Hawan they are breeding big mosquitoes to kill smaller ones. The big fellows, South African "cannibals" harmless to man, are imported and encouraged to multiply because their larvae feed on the young of native disease-carrying mosquitoes.

An idea of the cannibal's size can be gained from comparison with a ruler,

Crocodile Jaw Opens to Show Car's Innards

GARAGE mechanics who suffer from claustrophobia (fear of being in narrow spaces) will love this new Jensen 541, recently exhibited in London. To work on the car's six-cylinder engine, you simply lift the hood, headlights and grille as one unit, as shown at right. This arrangement, the manufacturer points out, lets you see what's what without straining over fat fenders.





Crystals Magnified One Million Times

To THE scientists at left, the picture they are so intently studying is more interesting than a TV spectacular to most of us. It is the electron-emission pattern of a single tungsten crystal magnified a million times. The big blowup is made possible by the recent adaptation of the field-emission microscope as a research tool by scientists of the General Electric Research Laboratory.

They Say Now

JACK W. RIZIKA. MIT: "There is reason to assume that any aero-technological gap which once existed between the USSR and the Western powers is all but closed."

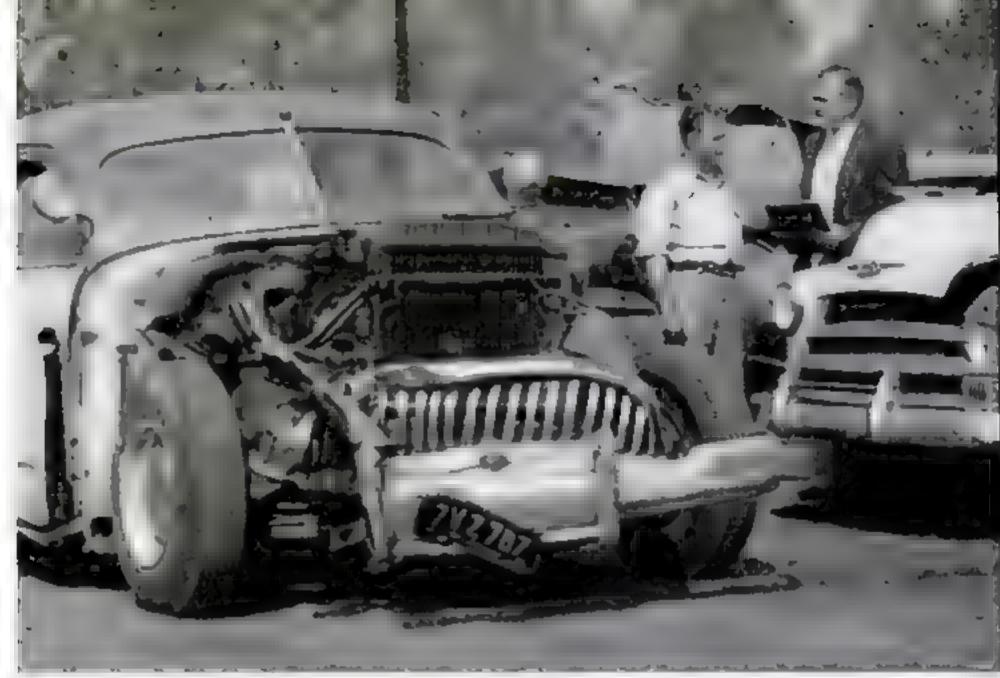
BRIG. GEN. DAVID SARNOFF, CHAIRMAN OF THE BOARD, RCA: "I have always proceeded on the theory that whatever the mind of man can imagine, the mind of man can produce."

DR. ELGENE AYRES, GELF RESEARCH AND DEVELOPMENT CO.; "If it is possible to teach

genius instead of merely hoping it will come along, the future will belong to the society that first discovers how,"

Phil. Pretz, Ford engineer: "We expect to see highways where drivers are encouraged to travel in the proper speed lanes... highways which will steer the our if the driver has a momentary lapse."

THOMAS E. MURRAY, COMMISSIONER, U.S. ATOMIC ENERGY COMMISSION: "Atomic energy has resulted in the greatest change in man's relations with nature since the fateful day in the Garden of Eden."



An investigator from the Los Angeles County sheriff's auto-theft detail checks up on wrecks

Detectives reveal the latest tricks of master auto thieves to help you avoid the embarrassing and costly confession:

"My Title Has



Lieut. Richard Brooks, chief of Los Angeles stolen-car squad, scans theft reports.

YOUR opportunities for buying a title only, when you think that you're getting a car to go along with it, are now greater than ever.

That's because, right in the midst of the biggest wave of car-stealing in history, the professional thief has learned how to provide each hot car he sells with a title that may look—in fact may be—perfectly valid and legal.

But however good the title is, the car is hot, and its driver, sooner or later, is very likely to be stopped by a cop who will say. "Sorry, but you are driving a stolen car." The vehicle, of course, will be returned to its proper owner—and the man who bought it will be out his money.

But if fraudulent titles come high to the customer, they are fairly easy to the car thief. He gets them in lots of ways, all over the U.S:

 In Pennsylvania, one thief went to the motor vehicle bureau, posed as a runner from a reputable dealer, and pre-



whose title papers may have been transferred to stolen vehicles.

By Andrew R. Boone and Gardner Soule

No Car"

sented what appeared to be 15 applications for titles to new cars that had just been delivered to the dealer. The thief got the titles. Then he proceeded to steal cars that matched in color and model the fictitious autos he had described. He changed the engine and serial numbers to correspond with those he had dreamed up on his applications. Then he sold the hot cars, each one accompanied by a dealer's title.

- In New York, a ring of thieves snatched autos in New York City, drove them to Poughkeepsie. There they proceeded to change engine and serial numbers on the hot cars; to fill out registration blanks—available in New York to anyone—to conform to the phony numbers; and, with a fake rubber stamp, to affix what looked like the seal of the New York motor vehicle bureau. The cars were then sold either by want ads or by dealers in league with the ring. One crook alone sold cars to six trusting clergymen.
- In Los Angeles, an auto thief purchased the wreck of a

How cops fingerprint an engine number



Suspect number is wiped with gasoline.



Grime is scraped off with wire brush.



Lampblack is dusted over surface.



Sticky tape, pressed on, brings up print.



Tape is stuck on card to make copy that can be examined for signs of forgery.

How thieves make a phony plate



Cops keep lists of licenses from stolen cars. To throw them off, thieves may cut plates apart and carefully splice them into new numbers to match switched registration papers.

green '53 Chevvy. Then he stole an identical car He changed engine and serial numbers to match those on the papers of the wreck, and sold it, using the registration of the wrecked car. It took the L.A. officers, who watch what happens to wrecks, just two weeks to track down the crime and to bring the bad news to the perfectly innocent cus-

tomer. In this case, however, because the title to the wreck was perfectly sound, the customer ended up with the engine-the only part of the

wreck that could be found.

Two for the Money

 In several states, this has occurred: The thief buys, legitimately, a new car and gets with it good papers. Next he reports his registration papers lost, gets a duplicate set, and has two. Then he steads a matching car, changes its engine number to match that on both sets of papers, and sells both cars. Not even the customer who buys the legitimately registered car is safe. The thief probably got it for only a down payment; its real owner is an auto dealer or finance company to whom it must be returned.

 In 13 states, where no proof of ownership is required when you register a car, there is nothing to getting title papers. The crook applieshe doesn't need a bill of sale, a last year's beense, or anything else, for that matter-and gets a title. Then he peddles a hot car under this perfectly legal registration. The legality is no protection for the thief's customer, however, for a crime was committed when the auto was stolen, and the rightful owner will get the car

back whenever it is located.

Title-switchers and their titles are so convincing these days that they fool not only the public, but also experts like banks, loan com-

panies and even auto dealers. In California, a title-fraud lad buys a wreck for its papers. Then he borrows or rents an identical car. He attaches a metal plate with the wreck's serial number to the other car's body, and smears on grease and dirt so that the number appears genuine Then he drives to a bank or finance company and, with the wreck's papers, borrows all he can. Then he removes the phony serial number, returns the car to its owner, and disappears.

Or the crook buys a new car by making only a down payment, forges papers to indicate that the vehicle is entirely paid for, and drives around obtaining loans on it. A recent case like this caused financial distress to five banks within 250 miles: All had loaned on the same auto.

License plates are always needed to go along with the titles. This is no problem to thieves smart enough to evolve the title racket. The plates are obtained in one of two ways: By stealing a set. Or by stealing two sets of plates, sawing them apart, and then soldering together halves of each set to make new plates with phony numbers.

How can you recognize the title-switcher? You can't. They follow no pattern, fall in no special age group. One recently

caught was 71 years old.

Girls Give That Feminine Touch

Or he can be a she. Title-switchers sometimes use even girls as "pushers." In New York City, recently, four title-switched Cadıllac convertibles, identical down to the same engine and serial numbers, were sold the same day by glamour girls to legitimate used-car lots. Each girl explained that she was "a TV actress who had to catch a plane to Hollywood."

If you can't recognize 'em, is there a sure way not to get stung? There is: Know the

man who sells you a car.

If you are buying from a personal acquaintance, you are probably safe—if he, in turn, knows he got the car from a reliable seller. If you are buying from a dealer new to you,

ask the local Better Business Bureau about him. If he is a responsible local dealer, he will, if he sells you a stolen car he has innocently purchased, repay your money.

If you are dealing with an individual you do not know, avoid falling for a big bargain. Something is wrong if a man (or glamour puss) is willing to sell you a car for less than could be obtained at the nearest used-car lot. Check the numbers on his papers against engine and serial numbers—a garage can do this easily. But don't stop there. Check the registration at the motor vehicle department—a matter of a few minutes. Ask him for his bill of sale, and check with the previous owner.

"If everybody knew the person he was doing business with," said an auto-theft detective, "title-switching would be no problem at all."

But, you ask, isn't the law able to do anything about title-switchers? It sure is. A few details:

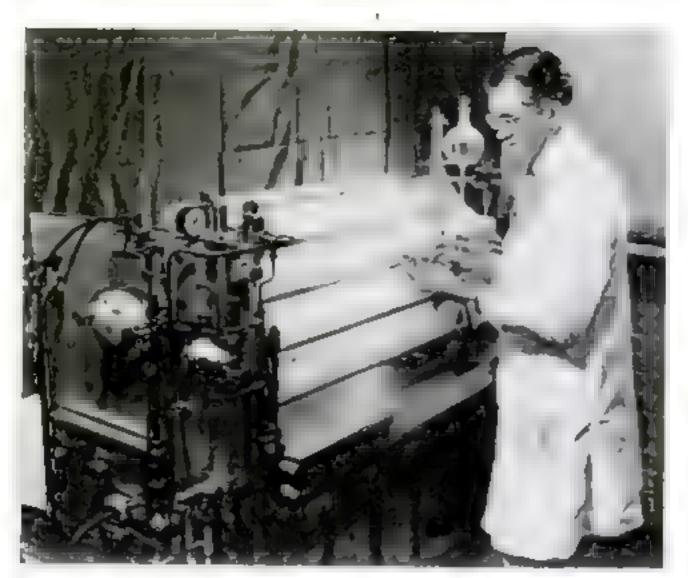
In New York, the law makes it forgery to use a phony state stamp on registration papers. Forging titles, therefore,

Skin test may show up hot car



He wary of buying a current-model car from a stranger if scratching the finish reveals a different original color underneath. It may be a stolen car that has been repainted to match the title papers taken from a wreck.

[Continued on page 302]



Lab Machine Analyzes ACTH Hormone

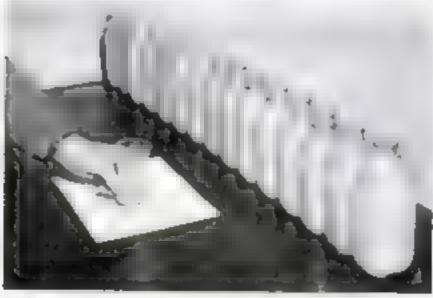
A citemical company's machine has completed a job in four and a half years that would have taken one person 165 years to accomplish,

Called a countercurrent distribution machine, it isolated eight components from the hormone ACTH. One component was found to be the most powerful. Dr. Paul H. Bell (left) of American Cyanamid directed the research.



New Antenna Is Scoop-Shaped

LOOKING like a giant sugar scoop, a new kind of microwave relay antenna developed by Bell Laboratories can handle 20,000 telephone circuits or 30 television programs at one time. The antennas will stand on towers as high as 300 feet.



Here's Your Vitamin—in a Berry

The richest known source of vitamin C is the berry juice of the acerola tree Now being produced in Puerto Rico, one six-ounce glass of it equals, in vitamin content, 15 quarts of orange juice.

Key Carrier Glows in the Dark

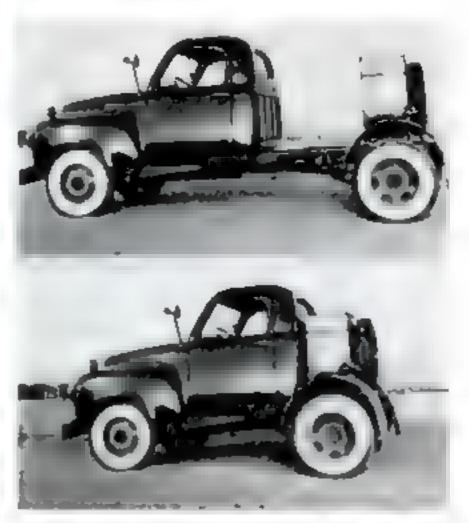
Expose this key case to the light for a while, and it will glow in the dark. Made

of polyethylene plastic, it has been treated to store up light energy by day and emit it at night. It is manufactured by the leather-goods house of Osborn Brothers, 223 Jackson Blvd., Chicago 6.

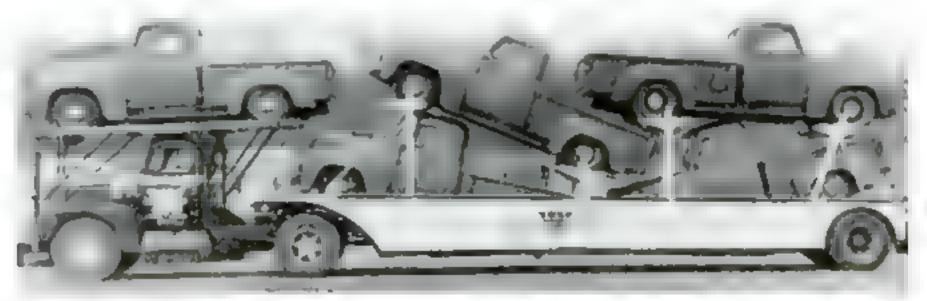


Squatting Truck has a bed that goes up and down hydrauheally for easier loading and unloading. It's in operation in San Diego, Calif. Called the Hi-Lo-Truck, it is a prototype with patents pending for manufacture. The C & R Transfer Co, uses it.

Trick Trucks Transform Transport



Stretchable Truck, the Trailer-Toter, made by the Whatoff Motor Co., Ames, Iowa, can expand its wheelbase from 82% to 120 inches in about 10 minutes. A winch extends and shrinks the frame. Shp joints simplify changing drive shafts.



Truck-Toting Truck is a converted, fourcar trailer that can carry five small trucks one atop the cab, Removable hydraulic jacks cock the vehicles at angles. The truck, which can be converted for general freight, was designed by Nicholas Demos of the Kenosha (Wis.) Auto Transport Corp.

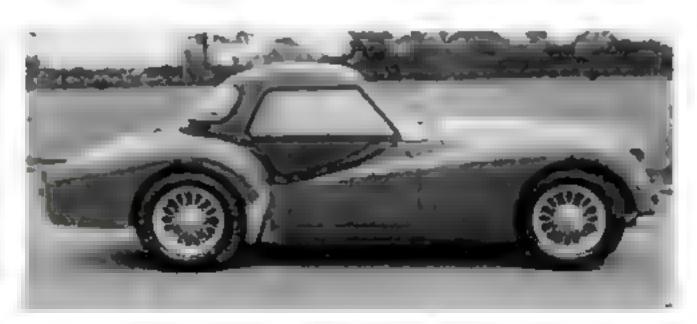




JAZZIER JAGS have new power and more choices. In new XK-140 series (top photo) rated power has been increased 30 hp. to 190, mainly by higher valve lift and better breathing. A special cylinder head can bring output up to 210 hp. Other options include automatic transmission or overdrive, and roadster. coupe, convertible or sedan bodies. Below it is D-type competition model now offered for general sale (base price: \$5,300 at factory). A 250-hp. engine tools it up to 172 m.p.h.

English Sports Cars Get More Zip

TRIUMPH T.R.2 now has an optional detachable glass-fiber hardtop that can be left home in the garage if the weather looks promising. Car makes over 100 m.p.h. in road trim, and has hit 124 in racing condition. It has small engine (1,991 cc.) but is extremely light, weighing less than one ton dry. Price: \$2,499.



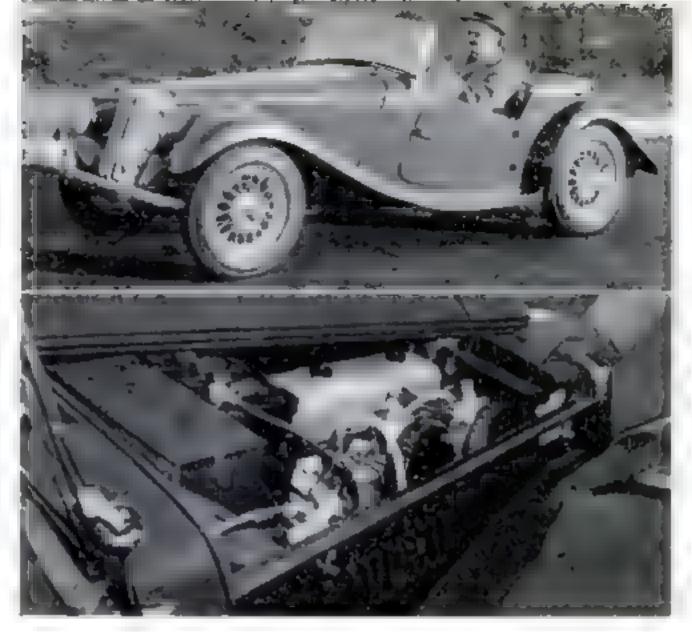


Tot Cot Overhead Keeps Babies from Underfoot

A LONG plane trip with a lapheld baby is no fun for a mother, and British Overseas Airways Corp. decided to do something about it. The result, demonstrated at left, is called a "Sky-Cot." It fastens securely to the parcel rack overhead, has a protective net to keep the little one from popping out in rough air, and still keeps him handy for needed maternal attentions.

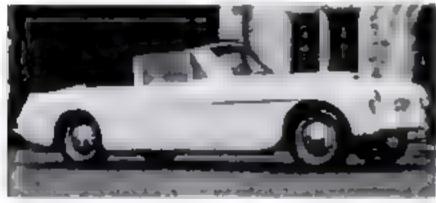
38 POPULAR SCIENCE

SASSIER MG has more perk under its bonnet, after years of getting by on tiny engines. The new 1500 MG at right has a 1.5-liter engine (actually 1,466 cc.), about 17 percent more displacement than before. The increase is solely in the bore, which is up from 66.5 to 72 mm. This increases horsepower from 57 to 63, and torque from 72 to 78 pounds-feet. Car is noticeably friskier to drive, clocking 0-60 times of about 16 seconds and top speeds of around 85. Price has been cut to \$1,995.



Mone power-achieved primarily through engine refinements-and more factory options are the dominant notes in the new crop of imported British sports cars. In sev-

eral there are slightly more concessions to driver comfort. Prices are either held or reduced slightly, though it is still possible to blow a wad.



BRISTOL 405 combines elegance with performance, costs \$6,300 at the factory. It gets well over 100 m.p.h. from 105 hp. Built by an aircraft firm, it has had long wind-tunnel testing.



AUSTIN-HEALTY 1005 is special competition model of sports car. Engine has been upped to 130 hp. and oil cooler and disk brakes fitted. A specially modified version has done 192 m.p.h.

Sun Replaces Battery In Peewee Transmitter

Solar energy, failing on selenium cells, powers the tiny radio transmitter shown with its builder, GE engineer Edward Keonnan. Its messages can be picked up at a range of 100 feet by a home- or car-radio. Transistors rather than vacuum tubes are used in its circuits, and range can be increased by using more or different solar-energy converters.



PEBRUARY 1955 39



Mechanical Worm Bores Tunnels

Titis monstrous mechanical earthworm, weighing 100 tons, will bore six long flood control tunnels at the Oahe Dain in South Dakota. As it inches forward on rails, steel teeth on the face (right) bite into dirt and rock while hydraulic jacks force the 10-inch knives and tapered cutting disks against the earth Similar smaller machines dig coal, but this is the first reported use of "continuous mining" in large-scale tunneling.



Buick Introduces Hardtop "Convertible" with Four Doors

Newest wrinkle in hardtop "convertibles" is this four-door model, demonstrated here by Buick's general manager, Ivan Wiles. It was displayed last month at the GM Motor-

ama in New York Conventionally, hardtops have only two doors because they have no center posts. To get four doors, Buick built center posts that rise only halfway.

Nozzies Show How Diesels Can Work Harder

THOSE strange horns at right blow air at motors and generators used in diesel locomotives. The idea is to find out how fast the machines can be run without burning themselves up. That depends on how the cooling air is blown past them. The queer nozzles, which can measure air flow very accurately, help General Electric engineers in testing different fan designs,

The electric fork trucks at a big ware-house were so quiet that they were a hazard. The solution: ball bearings placed loose in the hub caps. Now workmen hear the jingle of an approaching truck long before it is near.





Whirling Mikes Listen to Bell On Telephone

SPINNING microphones measure the noise your telephone bell makes. This sound integrator, developed by Bell Labs to check on the bell and volume control of the new adjustable telephone set, has microphones mounted on the four curved posts. These spin around the ringing telephone in the center, and the mikes pick up the bell's sound as they whirl.



How to Win

A Scotchman who lived 150 years ago has now granted both to the almost unknown father of modern magnetic recording.

By Herbert Yahraes

N THE desk in his cluttered laboratory in Chicago, a young man named Marvin Camras found a letter one morning some weeks ago telling him that he would soon receive a John Scott Award.

Puzzled, he telephoned some of his more worldly minded associates in the Armour Research Foundation of Illinois Institute of Technology. They congratulated him warmly, because it meant that:

Mr. Camras would receive \$1,000.

 His name, on the roster of John Scott Award winners, would be placed with the names of the twentieth century's most illustrious inventors.

But who was John Scott? No one could tell Marvin Camras anything except that he was a chemist who lived long ago in Edinburgh, Scotland, In 1816, Scott, for reasons that no one is now certain about. bequeathed \$4,000 to the City of Philadelphia, and asked that the income from this bequest "be distributed among ingenious men and women who make useful inventions."

A Distinguished List Gets a New Name

During the next 100 years, about 400 inventors received small gifts from the income that John Scott's \$4,000 bequest earned. Even so, the fund grew to \$100,-000. Since then, many more, and larger, awards have been made to such ingenious men and women as:

Thomas A. Edison Orville Wright Gughelmo Marconi Lee De Forest Charles F. Kettering Irving Langmuir Edwin H. Armstrong Eugene J. Houdry

Marie Curie Nikola Tesla Edwin H. Land Vannevar Bush

Nevertheless, more money remains to be distributed and Marvin Camras became one of five current beneficiaries of John Scott's thoughtfulness in a presentation ceremony held in New York last month.

To trace the ways that all of the winners of John Scott Awards qualified for the honor, one would have to write a detailed history of science and invention since 1816. Even to tell how Marvin Camras did it, one must turn the clock back about 30 years.

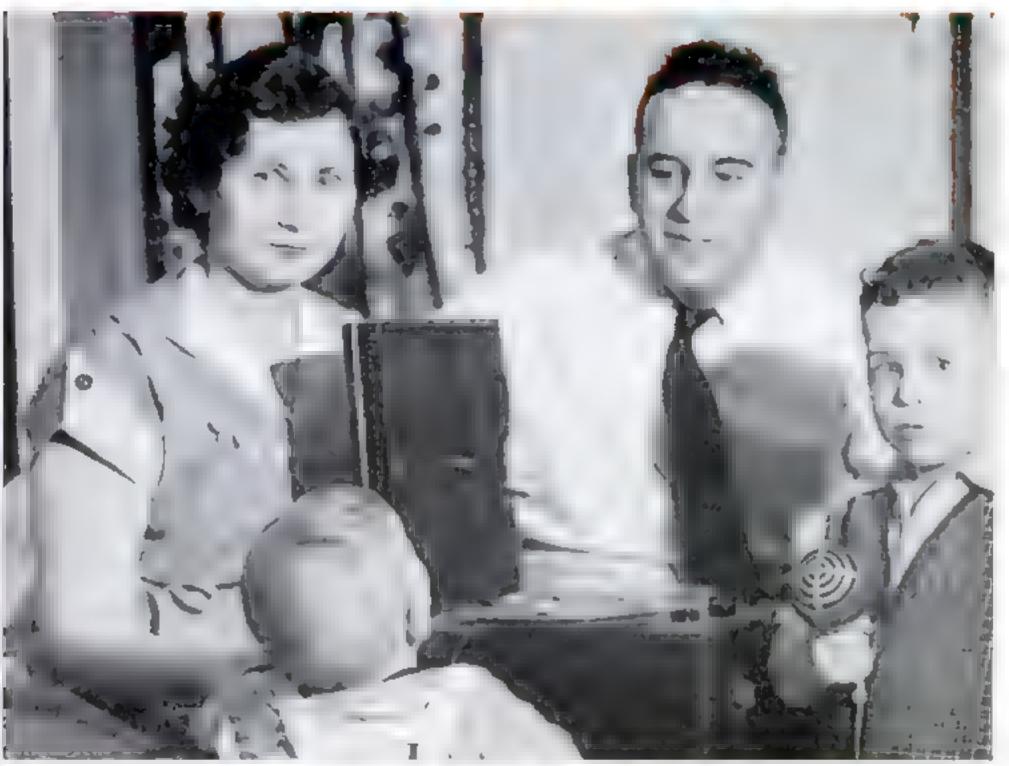
At 38. Mr. Camras is the father of modern magnetic recording. A shy, softspoken man with a slight accent, he has received little publicity outside of tech-

IN HIS LABORATORY, where lately he has been working on high-fidelity reproduction of sound from two sound tracks, Marvin Camras is shown below operating a magnetic-recording test rack.



42 POPULAR SCIENCE

Fame and \$1,000



Camras took this picture, as he and his wife recorded "voice snapshots" of their two sons.

nical journals. Yet an \$80,000,000-a-year industry has been built largely on his discoveries.

He Holds Over 200 Patents

His inventions are found in nearly all the tape- and wire-recorders now made. He holds more than 50 patents in this country and some 150 abroad. He has influenced developments in motion pictures, radio and television, office machinery, high-speed electronic computers and many other devices. Your son's life will probably be affected more greatly than your own by Mr. Camras' work.

Eventually, Mr. Camras predicts, most long-playing, high-fidelity records will

be on tape instead of discs. With home recorders you may be able to take down and preserve for a day or a century not only radio programs, as at present, but also television. With a unit small enough to be hidden in your pocket, you will be able to record the conversation of your lunch companion and the testimony of people who saw your fender smashed.

With this same pocket recorder you will be able to make "voice snapshots," and use these snapshots and other material to prepare a sound track for home movies. If you are in industry, you will be able to turn over the operation of a complex machine to another complex machine whose brain is made of magnetic

tape. Marvin Camras began the study of his profession at the age of five, taking a Eashlight apart and mounting the parts in a cigar box to make a lantern. A few years later he made a crude telephone, using a pillbox filled with granules of coke as a microphone. He and a cousin used it between their homes on Chicago's West Side. Then the boys built a wireless receiver—a crystal set—and a spark transmitter.

Marvin's parents had come from Russia. His father was a bookbinder, Neither

of them shared his excitement about communication sets. But when Marvin was 16, he became a hcensed radio amateur, opened station W9C5X (which he still has) and was elected president of his high-school radio elub.

He wanted to study electrical engineering when he finished high school, but the year was 1934 and times were

hard. So he clerked in a drugstore and took a few courses in mathematics and engineering in a school set up by the Federal Government to give work to unemployed teachers. Two and a half years later he entered what is now Illinois Institute of Technology.

A lucky break, Camras says now, led him into magnetic recording. His cousin wanted to be a singer and thought he'd get ahead faster if he could listen to his own voice. So he asked Marvin to help him build a recording machine.

His cousin had in mind a conventional disc device. But Marvin, who was then a junior in college, had been leafing through an old encyclopedia and had noticed a diagram in it of a Poulsen recorder. In 1898 a Damsh engineer, Valdemar Poulsen, had magnetically recorded sounds on steel wire, but nothing much had ever been done about it.

"How about trying one of these magnetized-wire machines?" Camras asked his cousin, and the ambitious young singer agreed.

Essentially, a magnetic recorder is a device for converting sound waves into magnetic impulses and then imposing them on wire or tape as a continuous series of tiny magnets. A five-minute recorded speech contains millions of these tiny magnets, varying in intensity just as the original sound waves varied. A piece of recorded wire or tape looks the same

> as a blank piece, but when it is fed back into the device, the magnetized spots are reconverted into electrical impulses and these, in turn, into sound.

The boys bought a pound of piano wire. They scrounged through the shops of second-hand appliance dealers till they found a one-hundredth - horsepower motor that had powered an electric fan.

Gears and spools Camras turned on a bench lathe at school. For an amplifier and some other needed parts, the young inventor cannibalized his radio station.

were about to start out for home. Joe instead got out of the driver's seat, entered the back of the car, and yanked the back cushion out. A few minutes later all was well and he drove away.

RETURNING to their car after a day's hunting, Joe and Moe tossed their gear

and red overalls into the trunk. As they

How Come?

seat of the car. was through the panel behind the rear the trunk, The only may to get them out ni bedeel need bad ban allarevo a'sol ANNERS All the cur keys were in

Camras Squeeses in More Magnetism

By reading everything he could find on the subject and by experimenting, Camras discovered what had gone wrong with the original 1898 recorder. One grave fault was that the magnetic print of a single sound had been spread over a relatively long length of wire—as much as a tenth of an inch. For clear reproduction, therefore, the wire had to travel very fast, perhaps 10 feet a second, and a tremendous amount of wire had been needed. Camras solved that problem by developing a magnetic head that imprinted the sound in the space of a thousandth of an inch.



frozen-lake fisherman could give more attention to his line and less to the ice chipper if he took a stove like this along. Straddling the fishing hole, the portable, charcoal-burn-

ing furnace would beam part of its heat downward to keep the hole from freezing up. Outfolded wings would also direct some warmth toward the angler, and he could use the grill top to heat coffee or cook a meal.

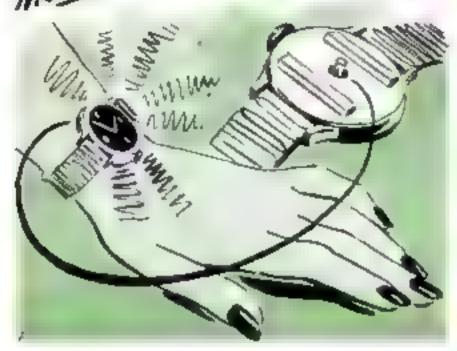


2 Chuck Key to Form Safety Switch. It wouldn't be easy to mislay this key or leave it in the chuck, because you couldn't start the drill until you had pressed the key into its own socket. The key-operated safety switch could be built into the body of the tool, or it could be made as a separate attachment and inserted in the line cord.



3 Tray to Crush Ice. People who prefer to cool drinks with ice chips rather than cubes usually have to hammer the little blocks into fragments. This refrigerator tray would do the job for them. Its built-in chippers, mounted on a central cam or screw thread, could be moved by a pivoted lever. Turning the lever would shatter the ice.

MORE New Ideas from the Inventors



Alarm Watch to Prod Wearer. A bell alarm of the type used in some watches may embarrass the wearer if it sounds off in a church, classroom or other public place. And in a noisy area he may not hear it. To overcome such objections, this inventor would substitute a vibrating plunger for the bell. It would signal by tapping your wrist.



5 Camera to Switch Film. You could load both color and black-and-white film in this two-reel camera and move either one into register with the lens and shutter. The film carriers would be separated by lightinght seals to keep the exposure of one film from affecting the other and to permit the rolls to be changed independently.



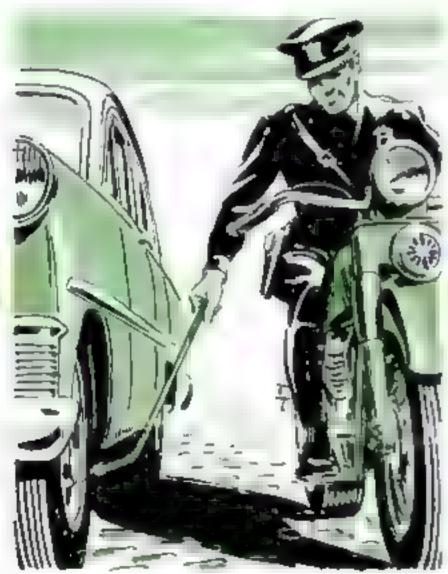
6 Door to Hold Back-Up Light. Ordinary reverse lights often shine the wrong way when you have to back and turn at the same time. This back-up light would reveal obstructions or soft shoulders alongside as well as behind a car or truck. Mounted in a ball

socket in the door frame, the lamp could be tilted up or down; moving the door would focus it sideways. The adjustable beam could light passengers in or out of a car, or illuminate street signs or house numbers out of range of head- or tail-lights.

U. S. patents on these inventions have been granted to: 1. G. Reven Minneapolis, 2 L. Griffin, Akina, Ohia, 3. A Giordono, trington, Va.; 1 M. Maribati, Jackson Heights. N. V.; 5. A. Incledon, St. Albans, N. V.; 6. R. Kaizer, near New Middletown, Ohia; 7. A. Herring and K. Baner, Philadelphia; 8. J. Sheets, Pasadena, Catif., 9. G. Matthews, Detroit.



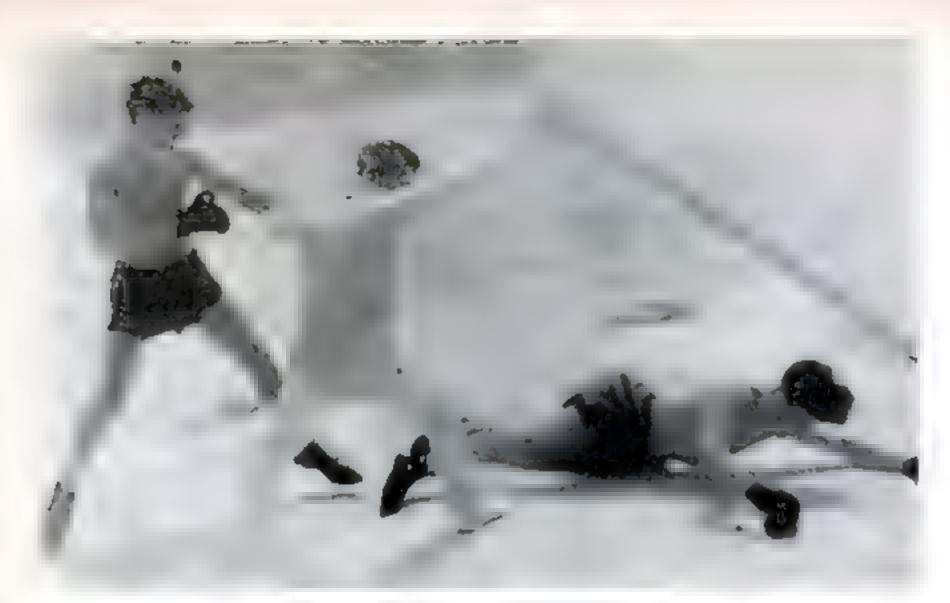
7 Tracer to Signal Near-Empty Can. When the contents of this squirt can changed color, you'd know it was time to get a new supply. A capsule of dye, under slight pressure, would be packed into the can. When the pressure of the ejector gas fell below that of the dye, the capsule would break and color the remaining contents.



Marker to Speed Traffic Check. As if parking tickets weren't easy enough to come by, this long-handled chalk holder would enable a mounted or motorcycle policeman to mark tires as he zipped through a block. When he checked back after the legal parking time had expired, however, he'd still have to write out the tickets.



Glippers to Fell Hot Wires. Stormloosened power cables are usually left dangling until expert linemen can reach them. But with this bullet-powered extension cutter untrained workers could snip them safely. The cutter's claw would hook over a cable; a blank cartridge, triggered from handle, would ram a blade against it.



World's Strangest Bout Is Fought in Underwater Ring

No one can say that this novel boring match put on in England was not a clean fight. It took place 15 feet below the water in the Empire Pool at Wembley. To complete a contest of two three-minute rounds the boxer-swimmers spent about four hours under water but were never submerged for more than a minute at a time.



Home Moves Along When Owner Travels

His engineering job keeps him on the move, but that presents no housing problem to James G. Mitchell. Runners under his house make it easy to load it on a hig truck for transportation to a new home site.

Carpet Cleaning Is a Sidewalk Business

Ittle searchty of home vacumic cleaners in Frankfurt Germany has created a new curbside sarvice for cleaning rugs and carpets. They arfed into one side of the strange-looking contraption shown at right. As the machinery inside beats and vacuums, the operator pulls them out at the other side all nice and clean.





Hoeing, said Howard Ober, was no fit job for man or beast—and did something about it.

Big Business Grown from Strawberry Patch By Harry Walton

MOST of us get nothing but blisters from hoeing a strawberry patch. But a 29-year-old engineering student doing that in 1936 also got an idea.

It was simply that a small engine should be able to swing a hoe much bet-

ter than human biceps—a thought that had probably occurred to many other gardeners.

What made Howard C. Ober of Newbury, Ohio, different from the rest was that he didn't forget it. He hung onto the notion and grappled with it for



Howard C. Ober

years. And now he has sold more than \$2,000,000 worth of machines based on that idea.

Ober, a soft-spoken, round-faced man with a deceptively sleepy expression, didn't perfect his hoe overnight. More

BACK-YARD FARMERS were quick to welcome the machine this inventor couldn't forget—a power-driven boe that walks as it works.



Attachments put the machine to work at many common chores

ard 2-hp. unit can till garden soil to a depth of four to six inches, ready for seeding. With

attachments, it can plow snow to 16", saw cordwood, edge lawns, cut high grass, chop leaves, mow lawns and spray insecticides.

than once he was forced to turn away from it to earn a living, do war work, and even invent some other things that led him into blind alleys. But he always found his way back to his motorized hoe, and finally produced such a machine, He calls it a Roto-Hoe.

An Engineer at Heart

Although his father had hoped he would become a farmer, Ober preferred engineering. At Tri-State University in Angola, Ind., he majored in electrical and mechanical engineering. His first job was in the standardization department of General Electric's Nela Park division. There he calculated filament specifications for lamp bulbs. "It was a 20-inch slide-rule job," he recalls.

Possibly to lure him back to the farm, his father set aside a patch of ground for him in 1936. Ober put in a hundred dollars' worth of strawberry plants. Weeds grew faster than betries in the hard Newbury clay, and Ober found—as he had

suspected all along—that at heart he was more of a gadgeteer than a farmer. Why not, he wondered, put blades or tines on a shaft which would revolve and both cultivate the soil and pull the machine? Could such a device be maneuverable and light enough to hop over strawberry runners without harming them?

In his first machine the tines were made of bolts with the ends hammered over to give them a hook shape. A sixtenths-horsepower engine from a washing machine was mounted on the frame. It didn't have enough power, "The thing stalled as soon as the tines hit the ground," Ober says.

His next engineering job took him to the coal mines in West Virginia. There he helped develop the use of Aerosol as a wetting agent to hold down coal dust. The strawberry patch was miles away, but he put a bigger engine on the hoe. It pulled the rotor around all right, but the bolts soon wore to stubs.

Ober then decided to try tines made

of cast malleable iron. He made a pattern for them, but two foundries refused to cast them. At a third, a young foreman named Dave Tuttle took pity on the inventor, and the castings were made. Tuttle is now a salesman for a nut-andbolt manufacturer, and Ober is one of his steady customers.

Inventors Have to Est, Too

In 1938 Ober took out his first patent on the hoe. The cast times were better, but still too soft. It was also hard to keep them tight on the shaft, So Ober substituted a hexagonal shaft for his first round one, and made the times with matching hexagonal holes.

By then Ober was married and had a family to support. "I've got to get money for the table," he told a friend. He took a job in a tool-and-die shop and stopped working on his power hoe. But somehow he found time to work out a couple of other inventions.

One was a coal saver that injected air through the fuel bed, another a thermostatic control that opened the check damper if the draft was left on too long Ober made several of these in his basement and sold them to apartment-house owners. But he saw no future in them.

In 1940 he took a bold step. By increasing the mortgage on his home and selling a few savings bonds, he accumulated \$5,000. With this and the machinery from his home workshop—two small



A SMALL MODEL is designed to work close in and around flowers and shrubs. It has the same 2-hp. engine as the standard machine and powers similar attachments. Revolving in a horizontal plane at about 400 s.p.m., the cutter can be attached either in front or in back of the engine. Two guard disks alongside it protect plants.



drill presses, a 9" lathe, a sheet-metal bending brake and a grinder—he made and sold a few hoes. Users liked them.

But along came World War II, and almost before he was in business Ober was out of it. Engine manufacturers could not sell him the midget power plants he needed.

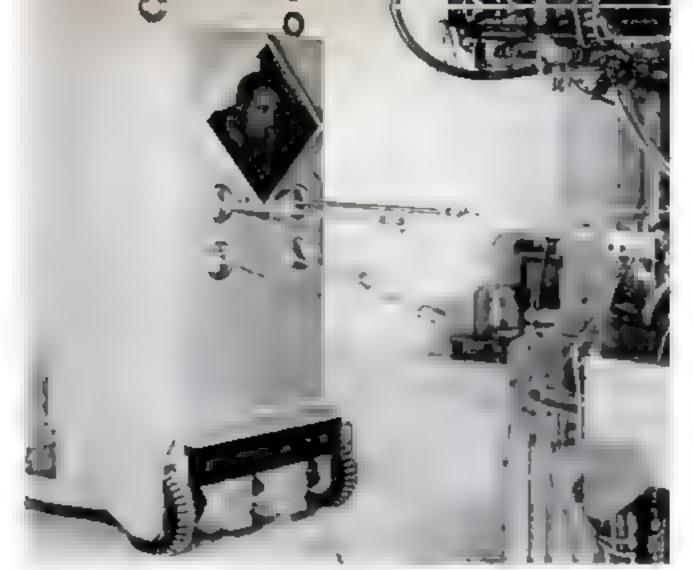
He took his skills to the S K. Wellman

[Continued on page 248]



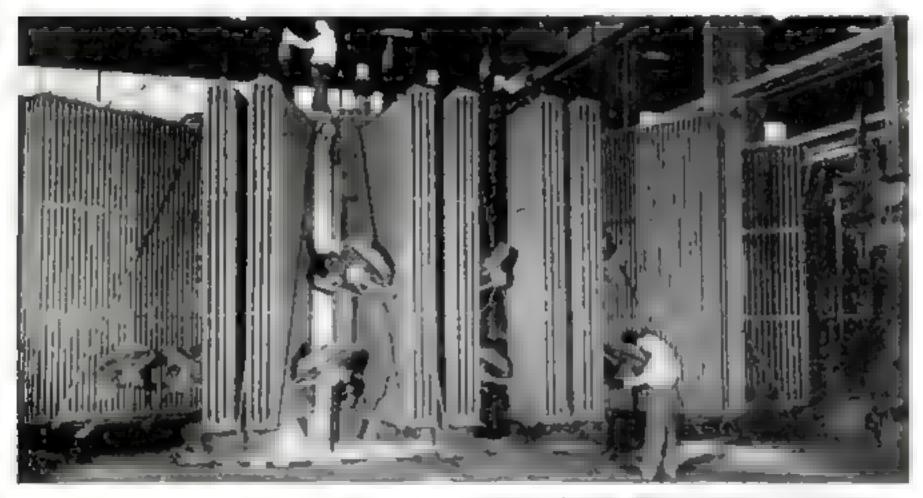
OPD JOBS COME EASY to the standard model. At left, it digs a trench. By removing loosened soil and going through again, trench can be made any reasonable depth. Center, it turns over and loosens a compost pile. Right, it stirs

poultry-house litter. Other attachments can convert the unit for spraying paint, pumping water or other fluids, generating up to 880 watts of electricity, and (with special cutting disks) aerating hard-packed lawns.



One-Man Tank Guards Worker From Hot Rays

SAFE behind the four-inch-thick lead walls of this "eyelomobile," an Argonne National Laboratory scientist is able to approach the cyclotron and manipulate four tongs to grasp and remove a target that has been made "hot" by a bombardment of nuclear particles, diamond-shaped window of the electricpowered car is made of lead glass.





Fans Cool Giant Transformer

What looks like a stage set above, is really the cooling system for a 196-ton power transformer, biggest ever built by General Electric, with a capacity to supply electricity to 500,000 homes. The cooling job is done by 23 big radiators and 46 fans.

Radio Controls Model Drydock

A SUBCHASER is high and dry for repairs in this miniature dock that rises and sinks at a signal from the hand-held radio transmitter. It was exhibited by M. Monseur at a recent model contest in Paris.

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fd Like to see them make...



A CAR STARTER that would work on six volts DC in the usual way or on 110 volts AC. Then you could plug into house current for cold-weather starting.—W. E. Hall, Medford, Ore.

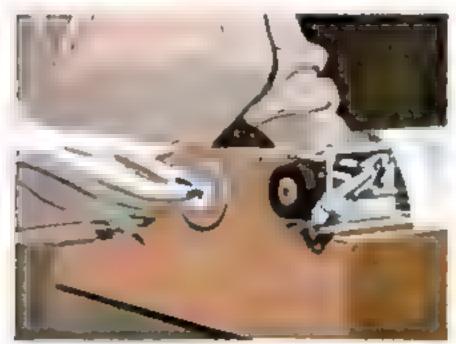


AN ILLUMINATED LEVEL for working in dark corners. There's plenty of room for a tiny flashlight bulb and battery in the frame.—Charles T. Pike, Embarrass, Minn.



plastic Medicine Droppers scaled in fractions of a teaspoon. They'd be easier to use than a spoon when dosing small children and babies.

—Pat Denton, Grand Haven, Mich.



A TYPEWRITER ERASER with a magnet on one side of the metal center disk so it would stick to the side of a typewriter.—Pearl E. Fitzpatrick, Gary, Ind.



AN ELECTRIC TOASTER that would open down the middle to serve as a hot plate for brewing coffee, frying eggs or heating the porridge.

—R. J. Dymaa, West Lafayette, Ind.

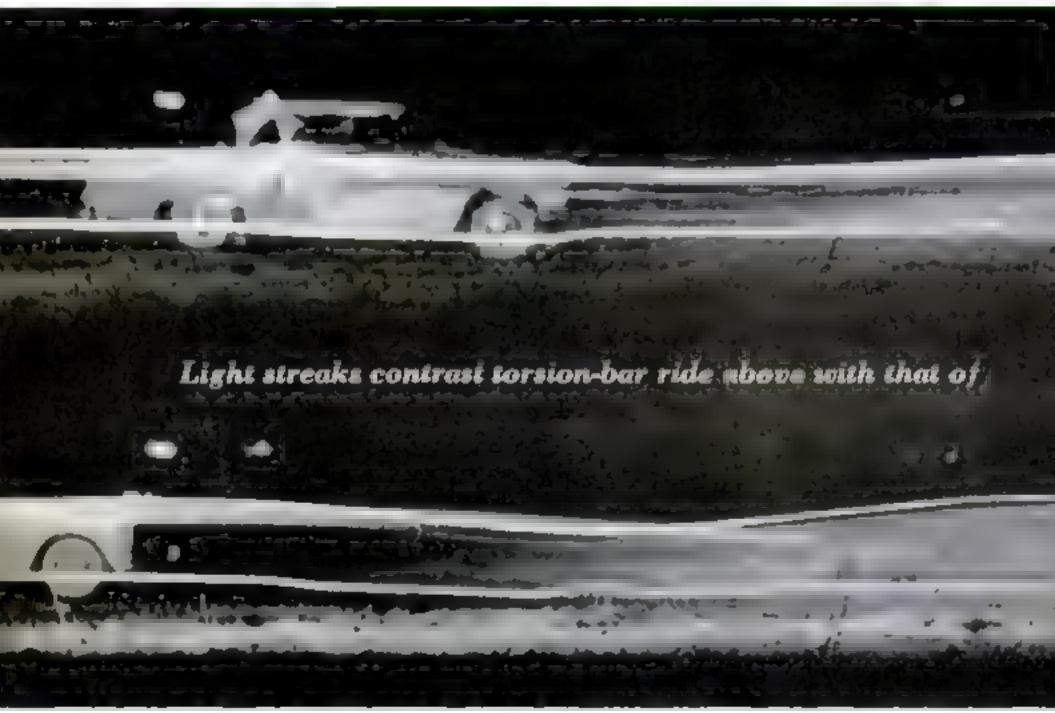
Everyone has his own pet afra of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by Foreian Science Monthly readers. What

is yours? We will pay \$5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be orknowledged or returned



PACKARD NAME is reserved for the big prestige cars like one at left. Clippers come in three series on shorter (122 in.) wheelbase. Torsion bars and big V-8 are optional on the top Clipper.

'55 Packard Glides on Torsion-Bar Suspension



Bulb mounted on wheel nut gives lower light trace on each car. Second bulb mounted

LOAD COMPENSATOR is demonstrated by having torsion bars and back of car comes up to design two people stand on back bumper (below left). For six seconds, car sags almost to limit. Then a geared electric motor winds up the leveling

height (center) despite load. Back rises up extra high, right, when load is removed but after six seconds car returns to exact level.



By Frank Rowsome Jr.

largely eliminates "bottoming."

PHOTOS BY HUBERT LUCKETT

HERE'S plenty of solid news this year from Packard, enough to make up for the lean years. Highlights:

A radically different suspension that does away with coil and leaf springs, and that combines two hitherto irreconcilables—soft riding and stable handling.

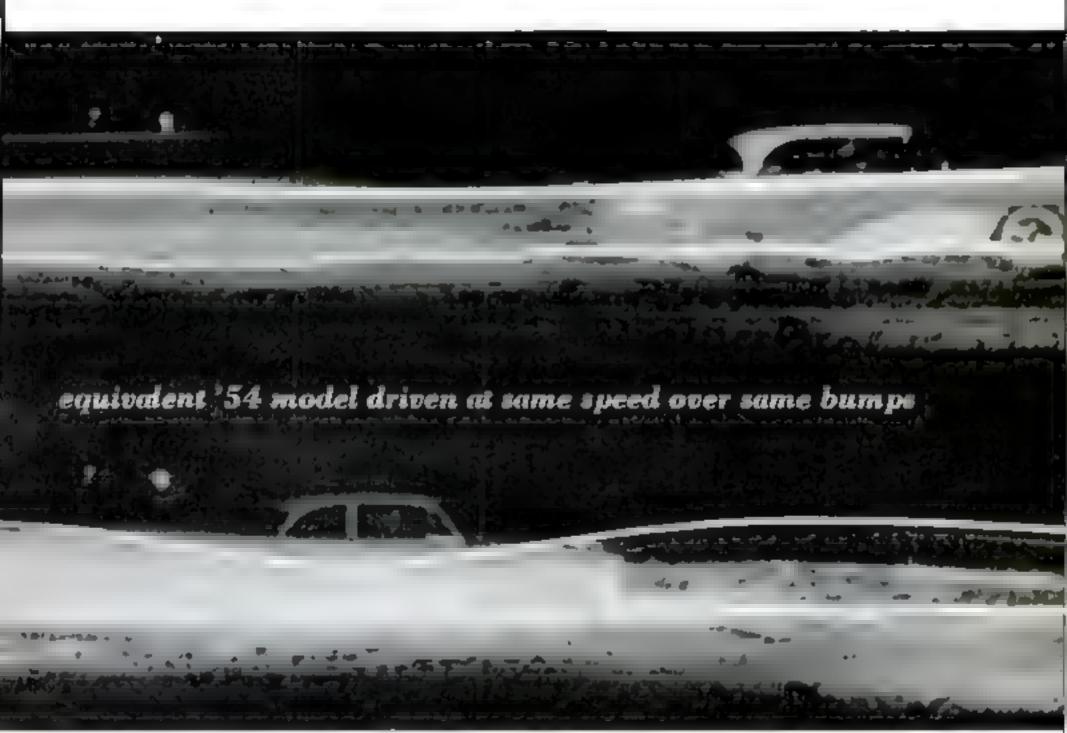
A slick mechanism that automatically levels the car fore-and-aft, and that

 A pair of brand-new V-8s, brimming with torque and power.

 A redesigned automatic transmission, to provide gear-assisted starts for geewhilliekers getaway.

And a sheaf of such other developments as a 12-volt electrical system, wrap-around glass, fancy styling, and interiors of sufficient lushness for the transport of a 24-carat maharajah.

The new suspension, which can be best described by the seat of the pants, is a fascinating mechanism. For compar-

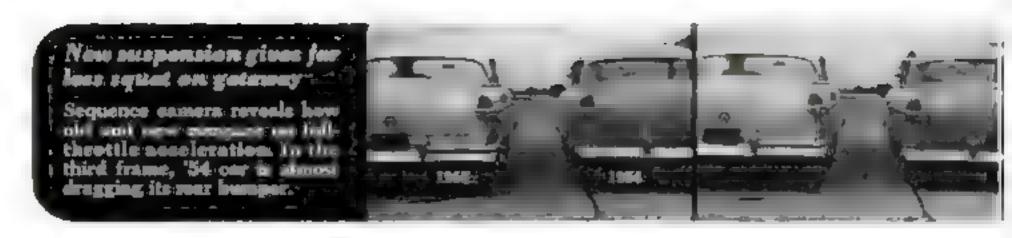


on fender charts behavior of body. This is a long W-shaped bump, taken at 35 m.p.h.

HEAVY BRAKING makes any car droop its snoot, but new suspension tames the tendency, as the sequence pictures below reveal. Both of the cars were going at same speed, with last year's model a half-length ahead, when brakes were jammed on hard. Older car shows a prenounced dive. New one lowers in front but does not rise as high in back, thanks to torque arms.







ison, PSM photographer Hubert Luckett and I first tooled a '54 Clippen over the mean back roads at the Packard proving ground. Like all Packards, the '54 gave a smooth, rather soft ride. But even though it was only moderately loaded, it proved willing to hit bottom when mildly provoked.

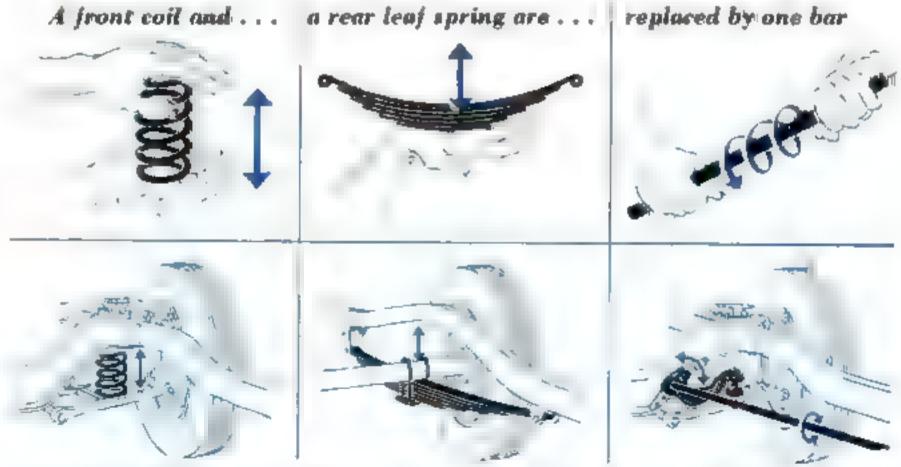
If you drove roughly, the '54 also showed a marked tendency toward diving when you belted the brake, and squatting when you tromped on the gas. Like the rest of the breed it still behaved in a gentlemanly fashion—who but a cad is going to flail a Packard?—but you were aware of the penalty paid for the softness of the ride

Then Lucky and I tried the same roads, at the same speeds, in a '55 Clipper with the new torsion-bar suspension. The ride was fully as soft, maybe even softer. The car simply swallowed up

bumps, the way a foam-rubber pad would swallow up surface inequalities of a piece of sandpaper.

Remarkably, however, there was no penalty for the absorbent cotton ride. The car did not bottom on entering deep dips taken fast, and it did not rebound like a frightened gazelle on leaving them. On washboard surfaces, there was no balletike wheel skitter. Best of all, the body showed a fine indifference to how you played the pedals; dive and squat could still be detected, but were tamed to insignificance. With torsion bars, the Packard personality changes from a dowager's to that of an able road car.

The problem. In quality cars these days the big thing is a boulevard ride." It has been classically achieved by softening the springs, letting chassis and body weight creep upward and searching



FAVORITE U.S. SUSPENSION has been coil springs in front, leaf springs in back, with rear ones also transmitting torque loads to frame. In new Packard, where a single torsion bar per side replaces both springs, front-end design is roughly the same but lever arm substitutes for the coil In rear, another lever presses against stirrup in torque arm running from axle to frame. The



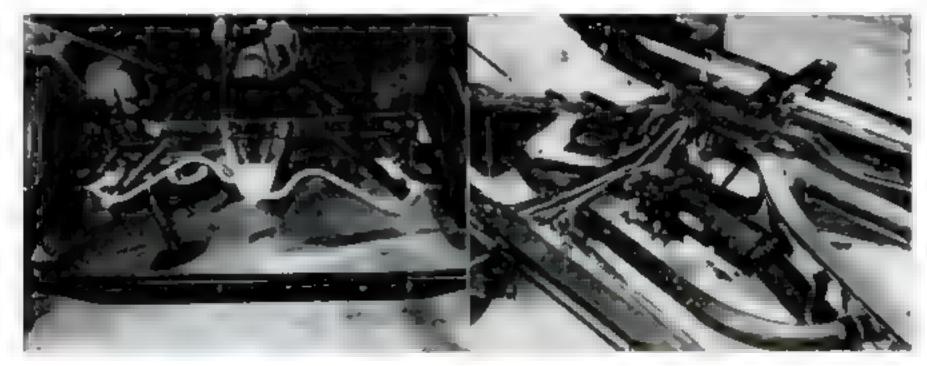
for shock-absorber valving that will tolerate such soft springs.

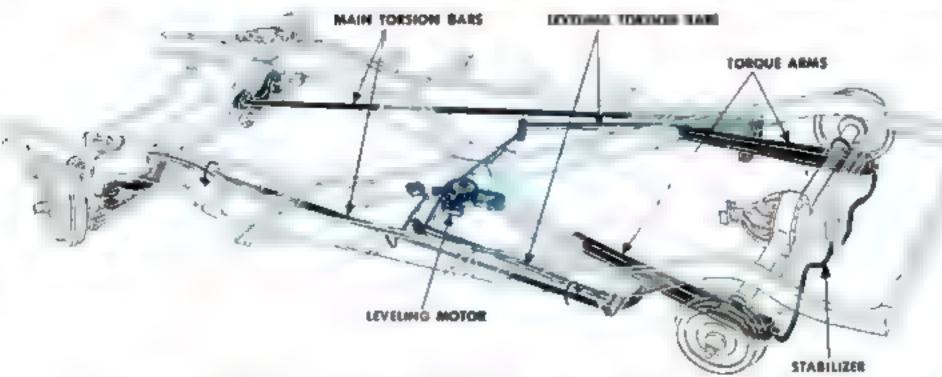
If you want to be shown, walk along a row of parked cars until you come to any expensive sedan built in the last few years. Put one foot on the bumper, in the manner of a small-town philosopher, and press lightly. The big boat will sink under your foot like a little canoe, revealing by its sponginess the degree of recent spring softening.

This hurts in some ways, of course.

Such a car is a slave to its shock absorbers, and leaps like an antelope when the shocks grow weary. Loaded, it tends to bottom repeatedly on the rear-axle housing. It has a wide height range, riding high like a barely ballasted tanker when only the driver is aboard, but running almost awash with a full load. Worst of all, it can display soggy or ill-tempered handling characteristics at high speed or on turns.

The treatment. Packard's torsion-bar





two torque arms take over the job of delivering rear-axle thrust, as well as brake torque and drag, to chassis. Pretzel-shaped bar in left photo above is stabilizer that ties axle against sideways movement. Heavily geared-down motor that winds up the ends of the leveling bars is shown in the right photograph above. It runs only when the car load changes.



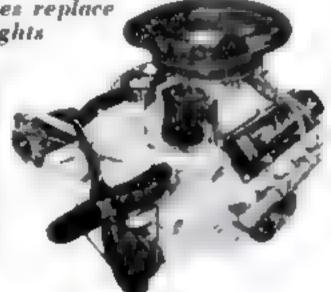
suspension tries a fresh approach. In place of coil and leaf springs the car uses two alloy-steel bars, about nine feet long and one inch in diameter, that lie roughly fore-and-aft along the frame side rails. The bar at each side serves as the spring for both front and rear wheels on that side.

Cranklike arms are secured to each end of the bar, to transmit the rotation that constitutes a torsion bar's springiness. Except at the ends, the bar floats free—there is an antivibration rubber collar in the middle—and the only loading it has is what is put in at the ends. The bar does not expend its twist on the frame.

How can chassis weight over the left wheels, say, provide opposed twist to the left bar? Plainly it wouldn't do any good to twist both ends of a free bar in the same direction. The answer, of

Big new V-8 engines replace the old straight eights

Rated at 260 hp., this brute has bigger displacement than any current U.S. passenger-car mill. It has oversquare proportions, "parabolic" combustion chamber, overhead valves, and four-barrel carb. In the de luxe Caribbean, hp. is boosted to 275.



course, is that the arms at the ends are fitted to the bar in opposite directions, roughly 180 degrees apart.

This means, among other things, that a force exerted on one end of the bar, as when the front wheel is deflected upward by a bump, does not get telegraphed to the frame as torsion. The force that whangs the front wheel up is simply spent in loading the rear wheel down. (More precisely, it is spent in winding up the torsion bar, but the reaction is mainly against the road in back.) The chassis and body just come along for the ride.

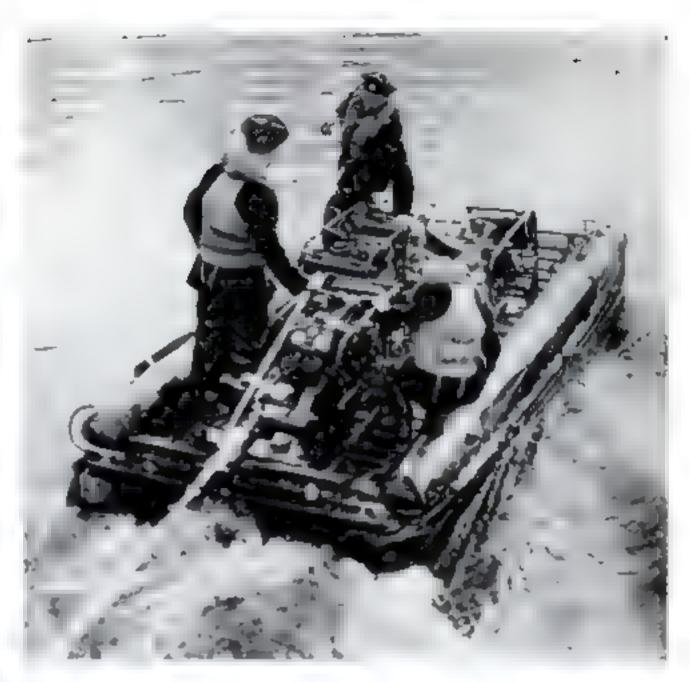
One way to visualize this is to imagine that you are a bulgy-muscled giant. Tilt a Packard so that the weight rests on the two wheels on one side. Then extend your arms out to touch both uplifted wheels and watch how, when you push the front wheel up, the back one goes down, and vice versa. (Incidentally, if you are a giant, and try this, you'll find that the torsion bar is preloaded—that it is "wound up" on installation, to balance out the chassis and body load at design height.)

[Continued on page 268]

Jet-Propelled Pumper Floats to Fires

Turn in a fire alarm near a river in an Eng lish village and three pumps on a raft may turn up to put out the blaze.

British auxoharv firemen serving waterside communities are trying out inflatable rafts that can be trucked to a launching spot and lowered by crane. Once affoat, the raft heads for the fire, propelled by a jet of water from one of its pumps. Together, the three pumps throw 1,000 gallons a minute through a halfmile-long hose.





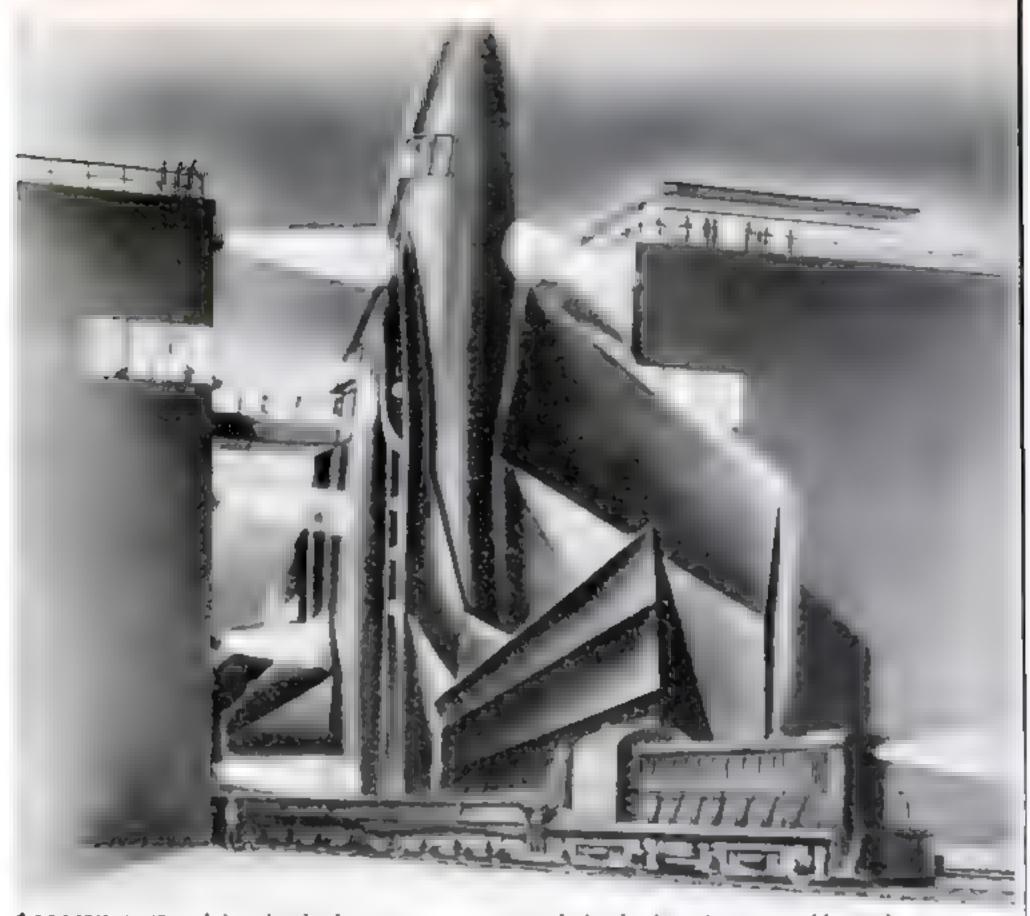


MECHANICAL collectors pick up tolls to feed cars through faster at the Union Plaza booth on New Jersey's Garden State Park way. Drop a quarter in the box and a light flashes green up ahead to signal that the automatic toll booth has collected its fee.



Ignition Needs No Waterproofing

A NEW Dutch ignition system kept this jeep engine chugging through the hosing above. The ignition was not waterproofed. In other tests by the Navy and Marines, the low-voltage system kept spark plugs firing even when they were coated with ice.



1 BOOSTER UNIT and its piggyback passenger ship would stand in nose-up, rocket take-off

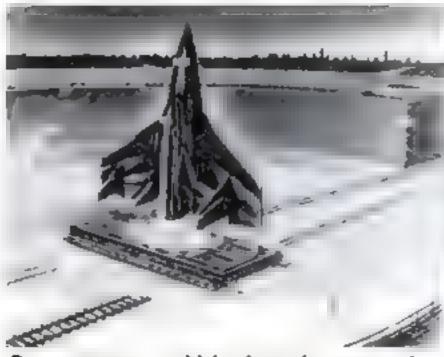
position during loading. A train would tow the 100-ton combo to the launching site.

Rocket Liner Would Skirt Space to Speed Air Travel

DESTINATION Earth is a new twist in passenger-carrying spaceships. Spanning the U.S. or the Atlantic would take an hour and a quarter, the Pacific an hour and a half. A piggyback ride on a booster rocket would start this superhier of tomorrow on a fantastic flight to an altitude of 200,000 feet and a brief

top speed of 17.500 miles an hour, 24 times the speed of sound.

How this high-speed, globe-girdling air travel would be accomplished is shown in these drawings. They are based on design proposals of a Bell Aircraft Corp. scientist, Dr. Walter R. Dornberger, who worked on German V-2 rockets.



2 LAUNCHING would be from the center of a heat-resistant pit, with eight rocket motors blasting off with a thrust of 760,000 pounds. Both booster and plane units are crew-manned.

4 TWO MINUTES LATER, at an altitude of 70,-000 feet, the passenger rocket would blast itself free from the booster, as the latter cut its rockets and glided back to base.



3 DURING TAKE-OFF, passenger seats would be 3 one above the other on each side of an aisle. They would rotate on a horizontal axis when the ship leveled off in flight.

5 PASSENGER PLANE'S ROCKETS would blast it spaceward for about two minutes, then be cut. Silently it would continue to climb, then lose speed and glide back to earth.







6 supersonic space-brushing flight would end in a gentle glide through the lower at-

mosphere, landing on a runway in the manner of a conventional airplane.



A midget midget, this 16-mm, camera fits over glasses to snap what your eye sees through the lowered view finder. It has an f/5 6 lens and a shutter speed of 1/30 of a second. Bruno Otto, Baaderstrasse 20, Nuremberg, sells this Colibri II in Germany for about \$3.50,

Photo News

A gold-plated camera no bigger than your cigarette lighter, the Minox (below) was designed originally for espionage work. It has an f/3 5 lens and makes with 11 shutter speeds from % to 1/1,000 of a second. It also features built-in green and orange filters. The Kling Photo Corp., 235 Fourth Ave., NYC, will send you one for \$300.



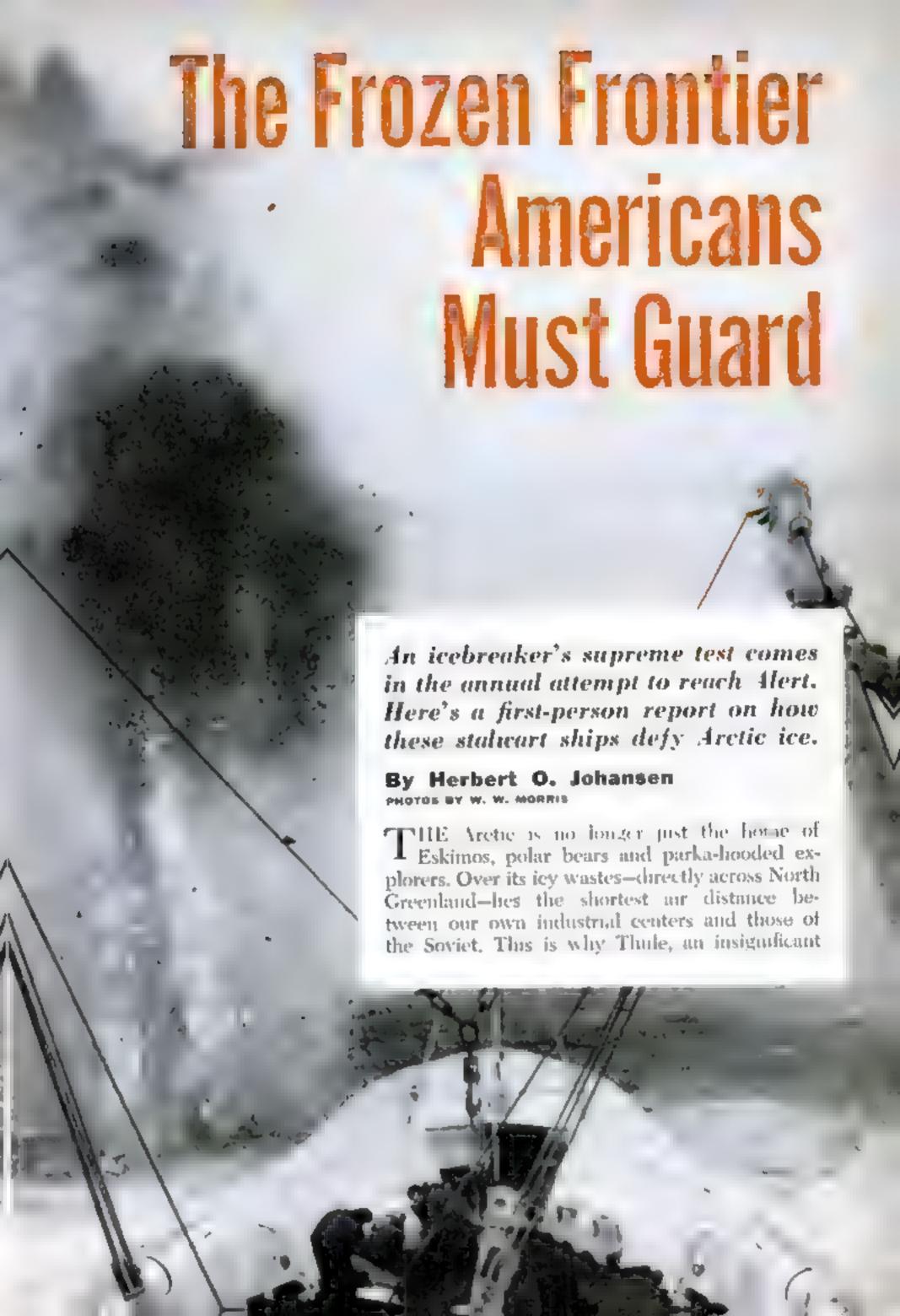


Color close-ups, needle-sharp and perfectly lighted, are easy with a new Eastman kit for the Kodak Pony camera. A lens attachment and metal L set focus and framing; a flash cover controls lighting.

A 3-D box-camera outfit includes a modemized version of the old stereopticon (below) for viewing. The camera is two units that can be taken off the mounting bar and used separately. Sears, Roebuck sells it.



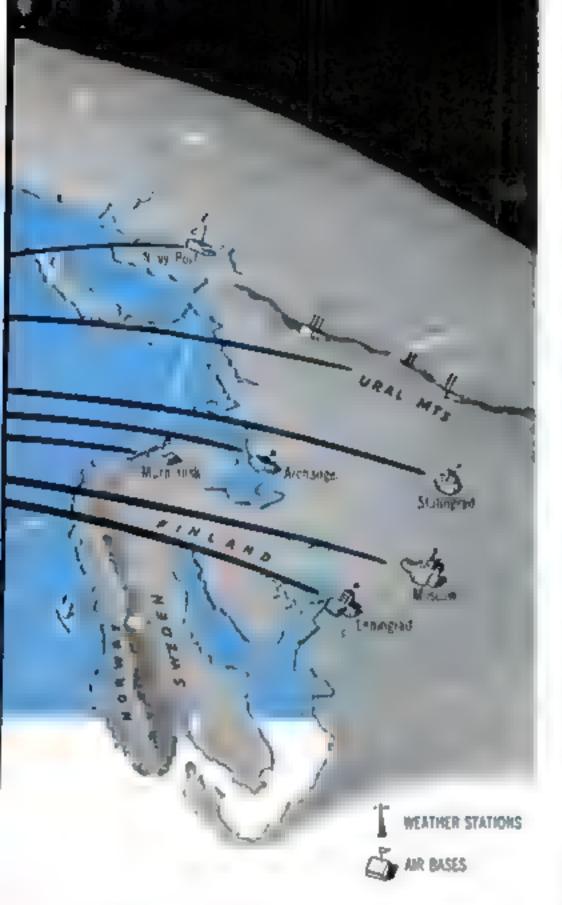
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Eskimo village only a few years ago, has become important in the strategic air picture. The shortest distance from Chicago to Moscow is via Thule. From Thule it is only 2,000 miles to Moscow and Russia's vital war plants behind the Urals. The Soviet Union's guided-missile centers on the Arctic Ocean and the Baltic are even closer.

When William W. Morris, chief photographer of Popular Science Monthly, and I left Boston last summer on the Navy icebreaker USS Atka, neither of us knew any more about ice than you can learn while juggling stubborn cubes out of refrigerator trays. But when we returned we talked knowingly about slush ice, brash ice and block ice;



strategic hub of the jet age

hour's jet flight from Greenland, why she has concentrated her air power and guided missile sites along the Polar Sea. It is why we need scebreakers, like the new U.S. Navy Glocier, to keep open supply-ship lanes through the frozen waters of our Arctic frontier, where ice must be mastered to maintain our defenses.

puddle ice, rotten ice and polar ice; ice that is ridged, rafted and hummocked, about icebergs, floebergs and growlers.

We learned on that trip—a trip that many more Americans must make in the years to come if our Arctic ramparts are to be secure—that the polar icecaps extend for some 5,000,000 square miles. Greenland's icecap alone is more than

two and a half times as vast as Texas. It covers more than 700,000 square miles of the island's 840,000 square miles, and some of it is more than 1,800 feet thick.

Our first glimpse of Greenland came when we passed Disko Island, Rugged, forbidding, clifflike mountains rose straight up from the waters of Baffin Bay. Their tops were covered with snow, and heavy snow nestled in the valleys that ran down to the sea. Or so I thought until Eric Fry, a fellow voyager, enlightened me.

What I thought was snow stretching far back over the tops of the mountains was the Greenland icecap, he explained. The snow-filled valleys were glaciers that had calved the icebergs floating around us, brilliant white in the blue water.

Mr. Fry is a tall, thin Canadian. His long, narrow face is furrowed and weathered from more than 30 years of exploring and surveying in the Northwest Territories above the Arctic Circle. He was on his way to the U.S.-Canadian weather station Alert, as a representative of the Canadian Department of Mines and Technical Surveys.

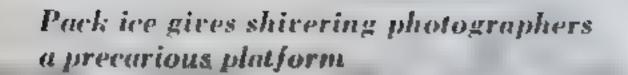
Baby Berge Are White

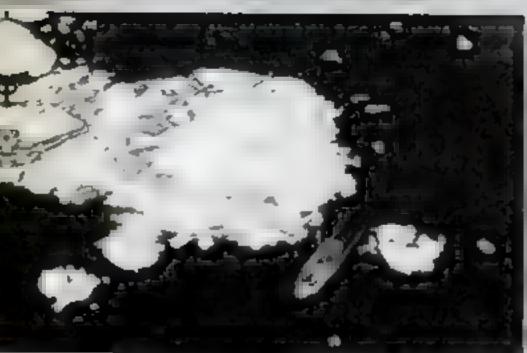
Mr. Fry pointed out to me why certain icebergs appear pure white. They are newly calved ones, he explained, consisting of snow containing quite a bit of air. Others have a bluish color, In these the snow has been further packed by the wind and weather and the compacted snow has congealed to a more icy solid.

When I started to focus my camera at Disko Island, Mr. Fry advised me to save my film until we reached real iceberg country up in the Devil's Playground. Those we were already among, he explained, were mere babies, only 50 to 75 feet high. Recalling that only about a seventh of an iceberg shows above water, I thought, "Some babies!"

The next morning, however, I was glad I had saved my film. We had advanced into a nightmare dreamland of towering icebergs. There were soft, white bergs;

[Text continued on page 108; more icebreaking photos on next two pages]





ON ITS WAY TO ALERT, 450 miles from the North Pole, the U.S. Coast Guard Fastwind picks a path through "leads" channels) between ice floes. She is headed for heavy ice.



A HERD OF WALRUSES crosses our rechreaker's path in Smith Sound Since the animals rarely go far away from ice they are a good sign that the techreaker soon will be going to work





CLOSE FRAMING of the hull is shown in this view of the Glacier under construction.

hard, glistening icy ones, tinted with varying shades of blue and green.

They would drift north with the current, then head across Baffin Bay to the Canadian side and head south. Some of them will arrive in the North Atlantic this summer, some not until next year, melting and rotten midgets, but still a mortal threat to thin-hulled ships.

"You'd think," said Mr. Fry, "that those towering icebergs would be swept swiftly

along with the wind, which would have little effect on low ice floes. But just the opposite is true. Flat ice is at the whim of the winds, The icebergs, on the other hand, because so much of them is under water, are impervious to the wind. It is the slow, often tortuous, currents that carry them along to their final destination and disintegration."

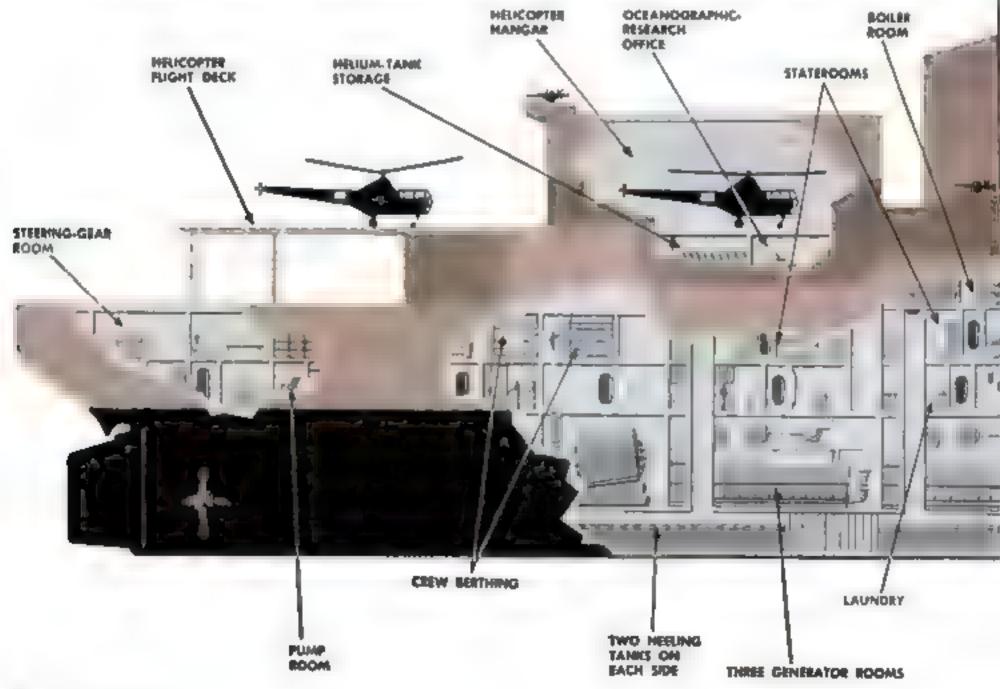
This time, when I brought out my camera, Mr. Fry raised no objections, He had his own camera in action.

Ice Pack Wears a Halo

"Have you noticed the ice blink?" he asked, after we had been climbing all over the *Atka* on our snapshot safari. I looked at him, puzzled.

"Ah, I'm sorry," he apologized. "I forgot that the Arctic is new to you." He pointed to the northeast. "See that bright halo of light out there?"

I looked, and did see a brightness. 'That's caused by the reflection of light on ice. It's called the ice blink. When an ice sailor sees it, he knows that he is



headed for an ice pack. We should be there in a couple of hours."

In retrospect, the ice we saw that day was not impressive. It was slush and puddle ice. A few days later I left the Atka to board the U.S. Coast Guard's Eastwind, which was scheduled to proceed to the northernmost land weather station in the world, a tiny cluster of shacks known as Alert. Once a year an icebreaker tries to reach Alert with supplies and personnel replacements.

On Wednesday morning, August 4, the Eastwind's loudspeakers bellowed that Capt. George H. Bowerman wanted to see Mr. Johansen on the bridge.

Capt, Bowerman was dressed in his parka, the fur-lined hood down, "Well," he said, "you wanted to see some ice-breaking. You're going to get your wish. That's polar ice ahead of us."

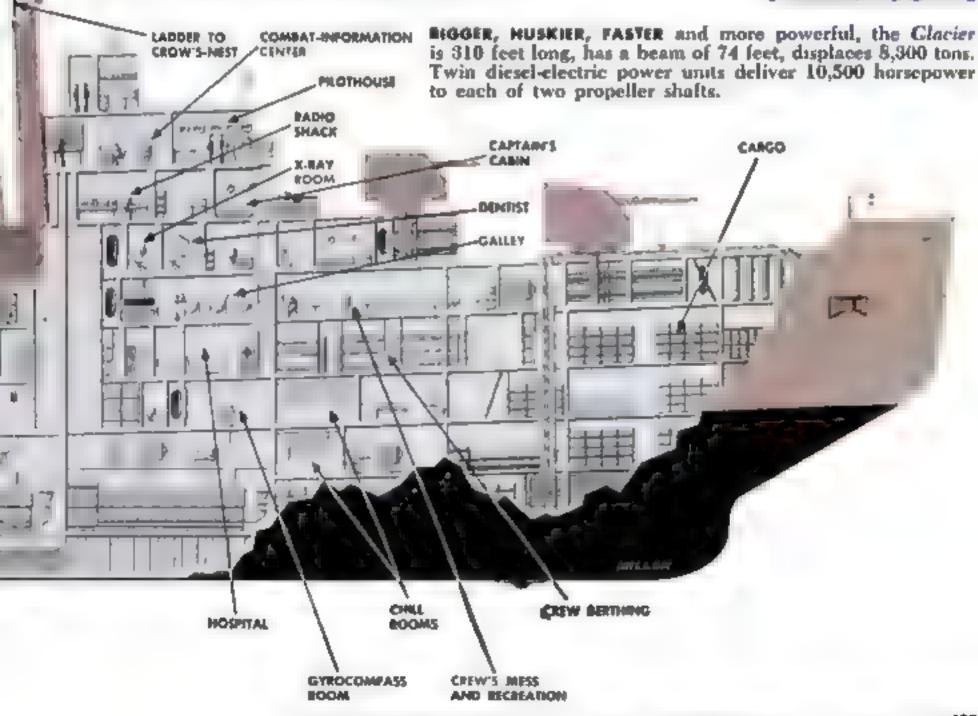
We were in Smith Sound, a little above latitude 78 degrees north, between the east coast of Ellesmere Island and the west coast of Greenland, From the fo'c'sle I already had seen the vast ex-



A NEW U.S. NAVY ICEBREAKER takes form. The Glacier was launched last August.

panse of pack ice toward which we were heading. It was awe-inspiring—white, with high irregular ridges, steely blue ice shining through where the snow cover had melted, cold, forbidding, lifeless—like the tortured surface of some science-fiction planet.

[Continued on page 264]

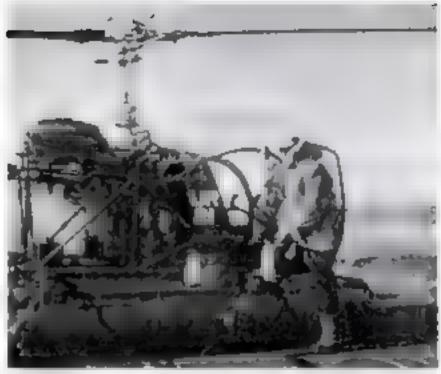


Please turn the page for Mr. Fry's adventures

Mr. Fry Finds Letter Lost Since 1876

MR. ERIC FRY, veteran of the Arctic and Canadian representative on the icebreaker Eastwind, wanted to be put ashore at Cape Isabella, Ellesmere Island, His objective: to take sun observations so that inaccurate Arctic charts can be corrected.

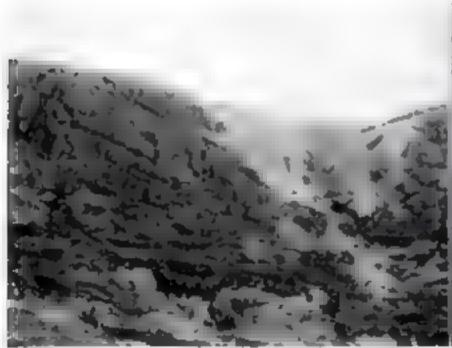
Mr. Fry got more than he bargained for, as is seen in these photos. Stranded on top of a 700-foot mountain, he had to be rescued by mountain-climbing crewmen. While waiting, he uncovered a rusty metal cylinder. In it was a yellowed letter left 79 years ago by an English explorer, telling another explorer that he



PARKA-CLAD MR. FRY boards the Eastwind's copter for bop to mountain at Cape Isabella.

was leaving dispatches for him in a cairn on another island.

P.S. Mr. Fry's Cape Isabella sun observations were dandies.



SET DOWN on this mountain top, Fry is marooned when helicopter breaks down.



DISASLED HELICOPTER is towed back to the icebreaker by a Greenland motor cruiser.



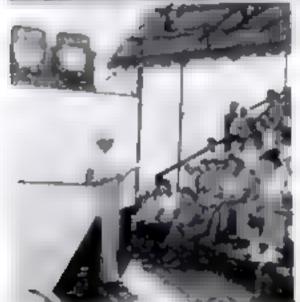
RESCUE SQUAD of husky seamen convoys Fry (carrying ice ax) to base of the mountain.



CAIRN FIND, a link with the past, is examined by Mr. Fry and Capt, Bowerman.

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Pro Coaches Lens Fans at Water Show

Bevenus girls, colorful settings and lots of action make Florida's Cypress Gardens a photographer's paradise. To top the take there's a special stand for shutter-bugs (left) with a pro on hand to advise amateurs. He makes frequent light checks and, from a control box, sets two overhead meters that give exposure readings for color and black-and-white shots. Even movie makers get help. They're told when to start shooting and are reminded to let the action go out of a frame for a view of open water before filming the next action.

Solar Stove Saves Up Heat After Dark

THAT'S a sun-cooked hamburger that Dr. Maria Telkes, a solarenergy scientist, is sampling at right. Four flat mirrors, cheaper than parabolic ones hitherto used. reflect heat into the heavily insulated traangular box, which contains a cooking tray surrounded by heatstoring chemical salts. The stove reaches 300°, holds cooking heat for about an hour, and has been developed for use in India and Near East. In quantity it may cost only about \$5.





Texas Engineer Designs "Flying Plank" Tailless Glider

BUILT from odds and ends, a tailess glider with rudders on the wing tips has been flown successfully in Texas. It is only seven teet one inches long but has a wing span of 26% feet. The cockpit, shown in the photo inset above, is a tight fit. The aircraft was designed by Al Backstrom, Change Vought structures engineer.



Muffler Smothers Jet's Roar

To REDUCE the roar of a jet-aircraft engine running at full throttle, a British manufacturer. Vickers-Armstrong, inserts the tail pipe in a muffer. It is so effective that at a distance of 1,000 yards the noise level is so reduced that it causes no annovance.



Twin Truck Scales Weigh Plane

To FIND out how the center of gravity of an amplane changes as fuel is consumed, a Texas laboratory uses two 30-ton motortruck scales hooked together. Hydraulic elevators simulate climbs, dives and straightaway level flight.

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Tanker Plane Soaks Bomber In "Rainstorm"

THE flying-tank car

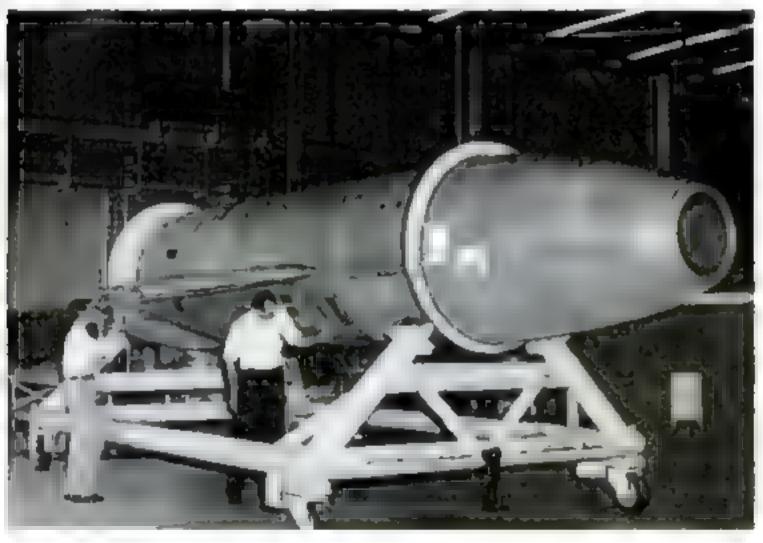
used to refuel bombers—has been given
another job in Kansas.

It douses bombers
with simulated rain to
determine how effective experimental devices are for removing
rain from airplane
windshields. Water
streams from a hose
in a boom that usually spews gas.

Boeing is trying out rain deflectors, heated air blasts and chemical water repellents on B-47's. Customarily, airplanes use the same kind of armtype wipers as cars.

▶▶▶British Bristol Freighter planes recently crossed the English Channel 222 times in a day to rack up a landing or takeoff every 89 seconds.





Whirligig Shakes Out Guided Missile

THE guided missile Regulus goes through one manufacturing process that nobody would dream of—it gets rolled over by a motor in a big jig

There's a reason.

As the cigar-shaped weapon is made, little pieces of metal collect in corners where a vacuum cleaner can't get at them. So, before the missile's engine is installed, the engineers let gravity remove the debris.



AUTO LAUNDERING is 30 years old. Slow handwork (left) has been replaced by mechanical washers (right) that make your car sparkle while you loll in the shade.

They Wash Two Cars a Minute

BACK in 1945 a Detroit businessman named L. J. Rousseau got irritated one day by delays while he was having his car washed. He decided that the only way he could get his car cleaned efficiently was to invent a production-line mechanical system to do it.

Today a million family cars throughout the country are being laundered ev-

ery weekend at scrubbing stations that embody Rousseau's ideas, Most of them complete a car a minute, Some can do it in as little as 30 seconds. The upto-date auto laundry is a group of machines that squirt detergents, warm water and steam over the body and wheels, then bathe

the car in gales of dry air. Human hands hit only a few licks to help out the machines. An electric-powered endless belt (inset), with an automatic safety feature to prevent a pile-up, keeps the cars moving.

Heart of any of the several systems in use at 1,400 laundries is a series of big, non-scratching brushes that swab off the dirt in seconds.



1 CLEANING JOB starts with attendant vacuuming interior, emptying ash trays. This plant can turn out two cars a minute.



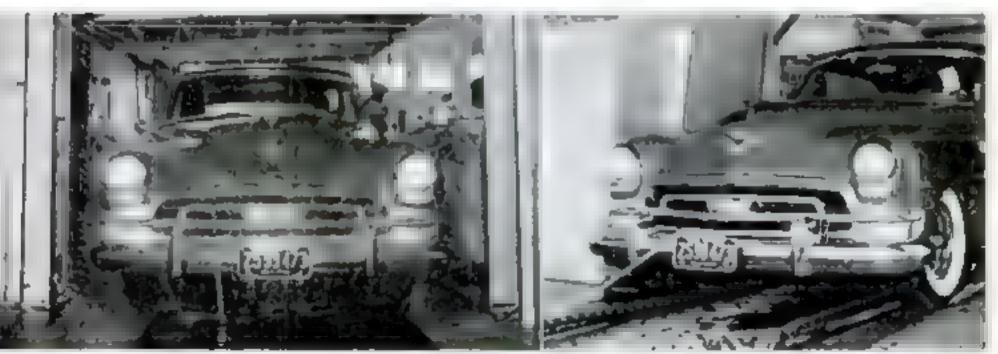
4 WIELDING SOFT FLEECES, workmen spread soapy solution over body and top. Two rinses in next 30 feet remove this for drying step.





2 TOW CHAIN is hooked to endless belt, driven by variable-speed electric motor, to pull car through 110-foot cleaning cycle.

3 NYLON BRUSHES turning at 150 r.p m. clean tires with detergent and hot water. Durly water empties into tank in foreground.



5 JETS SPRAY soft water on top, indes. Top spray can be cut off when a convertible goes through to prevent soaking upholstery.

6 WASHED AND DRIED, car emerges from laundry. If a pile-up threatens, a shear pin snaps when lead car touches post at end.



gets two barracks like this one completed every 24 hours. When finished with partitions, windows and air conditioning, each barracks will house 96 Leathernecks in the Marines' biggest Stateside camp.

Backwards Building Makes Barracks Cheaper

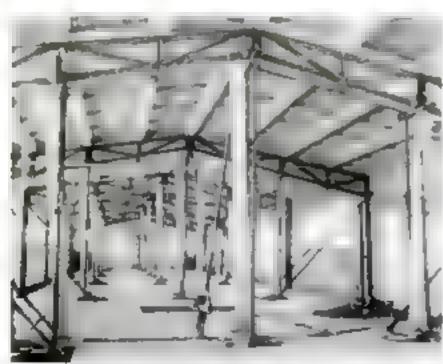


WALL SLABS GO UP FIRST. Cast on floor, they are tilted into position and held there by shoring. Entire camp will cost \$13,000,000.

BY BUILDING them in reverse, the Marines got a bargain in barracks. The long one-story structures, for the Artillery Training Center at Twentynine Palms in the California desert, were put up hindend-to: first the walls, then the roof and last the supporting beams,

This unusual technique made it easier to cast all the big concrete roof panels at one central production line. Walls were east on the barracks floors and tilted into place. The supporting beams were east through the roof seams.

Constructed this way, the barracks cost \$8.10 a square foot, including air conditioning. That's 15 percent cheaper than the average new home—without air conditioning



ONLY THE FORMS in which the roof beams are to be east support the heavy concrete roof panels, which were craned into place.



GAPS BETWEEN ROOF PANELS permit under-roof beams to be poured from on top of roof. Same operation seals up the gaps.

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These multiple-exposure photos trace the movements of people working at ordinary jobs—and one at play—while an ingenious laboratory platform (right) measures the peak effort for each task. Which of the four do you think was working the hardest?

You may be surprised at some of the answers: The peak energy of the man painting the ceiling was only one-sixth that of a man lifting a 50-pound weight. The woman ironing a shirt put out twice as much peak energy as the painter; and the girl filing papers in four drawers, nearly twice that of the housewife ironing. The tennis player's peak output was nearly six times the painter's.

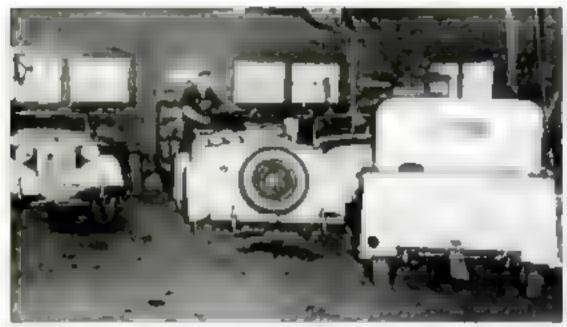
LAURU PLATFORM in DuPont's Haskell Laboratory measures energy used to lift a 50-pound bag.



FEBRUARY 1955 177



He Collects Young



GARAGE WILL HOLD a lot of these midgets. Collector here works on an engine surrounded by a '38 roadster, '39 phaeton, '41 convertible coupe and '39 pickup. The Bantam company turned out nine body styles in the brief space of four years.

QUARTER-TON PICKUP Bantam, vintage 1939, hauls hay for Cole ponies. Owner has rebuilt nine Bantams in four years. Vocationally a producer of marionette shows, he had to acquire his knowledge of auto mechanics as he went along.



With a soft spot in his heart for the Bantam (remember it?) George Cole now rebuilds these bygone buggies in his garage.

Antiques

SOME people collect stamps. Some collect coins, George L. Cole collects old Bantam cars.

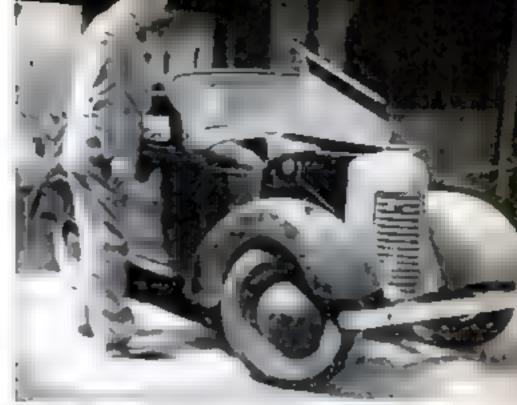
Remember the Bantam? All its upholstery was genuine leather. It weighed about a third of what today's Fords, Chevvies and Plymouths weigh. It had a 20- to 24-horsepower engine. Its wheelbase was 75 inches—10 inches shorter than that of Nash's little Metropolitan. From 1938 through 1941 it was made by the Bantam Motor Co. of Butler, Pa.

Cole has Bantams parked in the garage, the carriage house, the driveway and the yard at his home in Palos Hills, near Chicago. He has rebuilt a Bantam convertible coupe, four-passenger phaeton, convertible sedan, pickup truck, panel truck and station wagon.

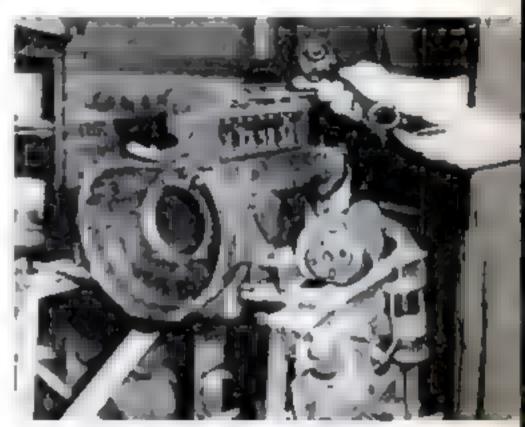
Cole's interest in the 1,200-pound autos dates from 1950, when he bought a 1938 Bantam sports roadster in Westmont, Ill, for his daughter. By the time he had finished rebuilding it, she had a snappy runabout and he had a new hobby.

Since then he has foraged many a scrap yard, back lot, garage and barn for Bantams and the parts. The standard models were built by a firm that was an heir to the American Austin Company.

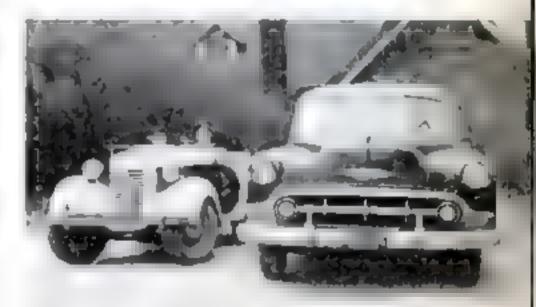
The Butler branch of Austin had been manufacturing pony-sized cars since 1930 under patents leased from Austin of England. In 1937 the American firm decided it was time to break ties with the old country and tool out a different machine. They gave up the parent firm's name and re-dubbed their cocky little doodlebug "Bantam."—Kenneth Wylie.



LAST BANTAM MODEL built was this 1941 convertible coupe. Flectrical system is six volts, hour wheel brakes are cable operated. Transmission is same as that in 1938 Graham,

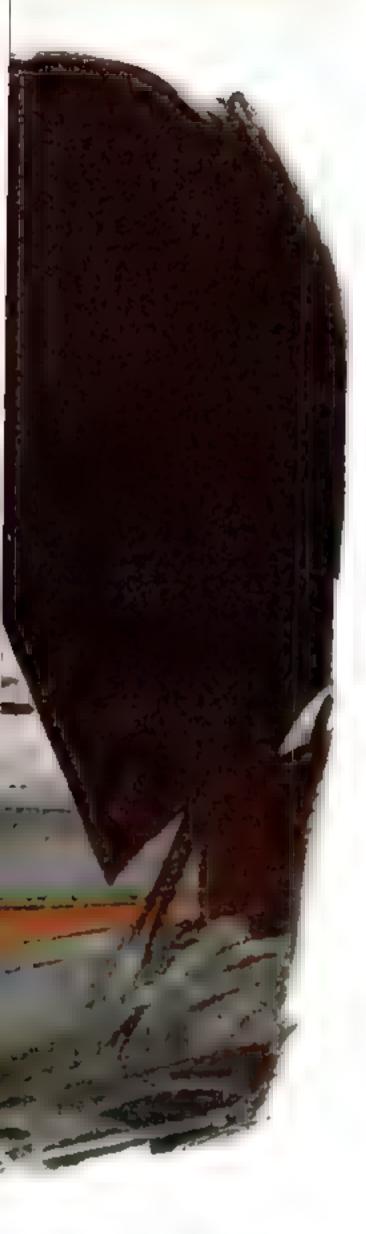


FOUR-CYLINDER ENGINE has 50 14-emberment displacement—2.26-inch bore, 3.13-inch struke Aluminum is used liberally in it. Three main bearings are pressure-lubricated.



BANTAM'S DIMENSIONS—10½ feet long, five feet wide—are emphasized by Chevyy along-side. Cole cars are painted red and white to make them extra-visible on open highways.





Running his neon-tube screwdriver over the plugs, then shorting them out one by one, proved to Gus that the plugs were firing, and ned the miss solidly to number four.

Gus Encounters a Stubborn Hiss

Had Miss Wilks lost her head over him?
... Or was it just a cylinder head that brought the lady to the Model Garage?

By Martin Bunn

WHEN Emma Wilks, the comely new school-teacher, drove her badly missing 1948 sedan into the Model Garage, Gus Wilson anticipated nothing more complicated than a routine repair job.

"After all," Emma said, her blond hair tickling Gus's burly neck as they peered beneath the raised hood of the car, "it isn't dignified for a schoolteacher to drive around with a bucking, missing car, is it, Mr. Wilson?"

"No, it isn't," Gus told her, carefully avoiding Emma's big, blue eyes.

Knowing that Emma had but recently bought the used car from a reliable dealer in the city, who had completely overhanded it, Gus at first suspected loose gaskets

"My, what strong hands you have," Emma remarked as Gus tightened cylinder and head gaskets.

Cylinder Compression Is High

With the motor still missing, Gus ran a compression check and found all cylinders high in readings. Running his neon-tube screwdriver over the plugs, then shorting them out one by one, proved that the plugs were firing, and tied the miss solidly to number four.

Full compression on a compression check, with the motor turning slowly with the starter, and a miss while running, with good ignition, suggested a gummed and slowly closing valve Since the new valve grind made this extremely doubtful, Gus's thoughts turned to a weak or broken valve spring, or too close a valve setting. Removing the valve

cover to check this, he was astonished to see one of the half-moon valve keepers of number-four intake valve lying on the cylinder head.

The remaining half of the keeper held the valve, but caused the spring to cock

to one side, binding the stem.

"Here's your trouble, Miss Wilks," Gus said,

"I just knew you'd find it," Emma gushed. "You're wonderful."

Red-faced, Gus removed the metal

cap that rode the top of the valve stem. to prevent excessive oil from running down the stem, held the valve pried up against the inside of the head with a crooked bar thrust through the sparkplug hole while he compressed the spring and replaced the valve-keeper half. The engine now ran smoothly,

"I just knew that I could depend on you, Mr. Wilson," the schoolteacher exclaimed admiringly.

"And you're a bachelor, too, remember, Gus," Stan Hicks chuckled as Emma drove out. Stan hummed the Wedding

March as he worked.

Ever since Gus had unwittingly bid on the new teacher's lunch basket at the church box social a couple of weeks earlier, folks had been eager to build a romance between Emma and the town's most eligible bachelor. Leaders in this were Gus's pals, the irrepressible Elmer Stoddard and Pete Vancourt.

"You'll be all wrapped up in matrimony before you know it, Gus," they had told him.

"Emma just bought that car so she could drive it in here for you to repair while she whispers sweet nothings."

"Go soak your heads," Gus had told them angrily. "She hasn't brought the car in to me yet."

"Give her time," Pete Vancourt had

grinned. "I'll bet her car develops more mysterious complaints in the next few days than a 1908 Model T."

And now, Gus thought, smoking at the bench, she had brought it in. But it wasn't a mysterious complaint. Whoever ground those valves just didn't put the valve keeper in all the way.

But the next day Emma again brought the car in—and Gus found the same valve keeper lying on the cylinder head.

"Now isn't that strange?" Emma said,

as she stood at Gus's shoulder

More than strange, Gus thought to himself as he replaced the keeper, bade Emma farewell and watched her drive out.

"Hahl" Stan Hicks chortled as she pulled away. "What did Elmer and Pete tell you?"

"Now look here." Gus bellowed. "If

you mean to intimate that the lady took that valve keeper out herself, just so she would have an excuse to come in here and—"

Gus balted in midspeech, while a wary look came to his eyes.

"But," he demanded of no one in particular, "how in tunket did it get out? Do you suppose that Pete and Elmer sneaked over at night and did it? They could, you know, with Miss Wilks's car parked behind the boarding house."

"Now, Gus," Stan advised, "don't fight it. When a lady sets her cap for a man, he's—"

Gus didn't wait to hear the last of this remark. He tossed his cap on the bench and went down the street to the restaurant. By the time he had returned the worst had happened. Pete Vancourt and Elmer Stoddard had gotten together with Stan Hicks.

"Brother," Stoddard greeted Gus, "are you hooked! Like a gaffed bass."

[Continued on page 244]



"I wish you'd stop annoying my wife and me with your used-car bargains,"



This special holder keeps the rod right on the beam for you



NEW ROD HOLDER has starting switch on handle that lets you position the electrode before turning on the fuice. Matchlike tip on rod is special conductive coating that makes it easy to start are without old striking motion.

resting it against the work, you can easily guide the rod along without having to hold your hand in mid-air. Welder works on any 220-voit, 20-amp. line or 110-volt, 40-amp. line.

no jabbing blindly in mid-air to strike an are in the difficult old-fashioned way.

It's not too expensive, either. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, has priced it under \$100.

Using some of the steel you now can buy in small lots from local hardware stores, I put the new outfit through its paces by building a lawn table for our terrace. If you haven't heard of hardware-store steel, you may want to know about it.

Handi-Steel, produced by the American Industrial Products Co., 1448 E. 49th St., Cleveland, can already be found in many stores and offers everything from small rounds and flats up to heavy square and angle stock in convenient carryhome lengths. U. S. Steel is also testing a similar package that may go on the market soon.

New rod makes it easy. The real key to do-it-yourself welding lies in a special new electrode—appropriately named Selfweld, since it does most of the work itself—developed by Lincoln especially for home-workshop use. It comes in two sizes, 5/64" and 3/32".

The new rod is so different from the old types that I actually had to unlearn

what little I knew about conventional welding. My first attempt was a struggle because I was pulling the electrode away from the work, trying to suspend the point in mid-air while running the bead along the joint.

That's what used to make welding so

Here's how you can make sound



ON LONG RUNS, it's best to tack pieces at several points before making complete weld. If you just start at one end, concentrated heat may warp metal, throwing joint out of alignment.



ON HEAVY STOCK, say above ¼" thick, you may need to build up several welds to form a strong joint. Lay first bead in center, remove slag, add successive beads in the order shown at the left.

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where you want it to weld. Thus you can rest holder on leg with rod just above work, close your face shield, then lower the electrode and be sure it won't land way off in left field.

IT WELDS BY ITSELF. Here's how no-hands welding can help you in tight spots where you need both hands to hold the parts. Rod, leg, and holder form tripod that stands by itself and keeps electrode on the spot you want welded.

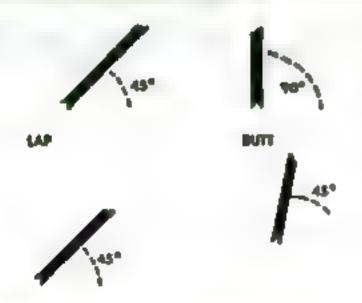
tough. If you don't think it was, try moving a pencil in a straight line with the point X" above a sheet of paper, without moving any closer or farther away. This spacing was needed to maintain the proper are distance.

Now imagine that the pencil is burn-

ing away a fraction of an inch every second so that you have to keep feeding it inward, and you're doing all this while wearing goggles so dark you can't see much besides the arc. There you have a fair idea of what welding used to be like.

With the new rod, you touch the tip

wolds of different types

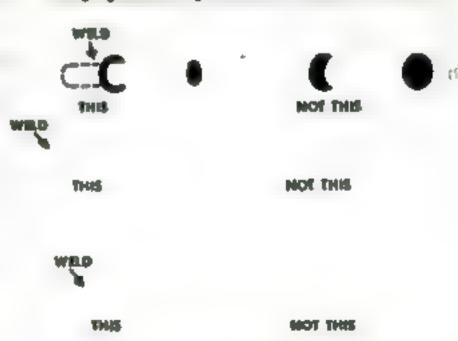


HORIZONTAL FILLET

FLAT-POSITION FILLET

All WELDS fall into one of three classes—lap, butt or fillet—shown above. Fillet welds are easier if you can block up the work so that the rod is pointing nearly straight down, as at lower right. In all cases, slant the rod 30° from vertical in the direction of travel.

Lap joints protect thin stock



KEEP THIN SHEET FROM SURNING THROUGH by using the lap joints above, so that you're always welding on two thicknesses instead of one. On tubes, slip a smaller diameter inside a larger one, or slot the end of one so that it can be forced over the end of the other.

right to the work, simply drawing it along the joint as easily as drawing a pencil along a ruler.

Coating does the trick. The secret of the new rod is a special coating containing powdered from that forms a shell around the wire core. The core burns slightly back inside the coating automatically maintaining the correct speed and are distance even though the shell is touching the work

The old rods were hard to start, too You had to strike them like a match touch them to the joint, and hastily yank



1 WELDED LEGS to 1" rails first, then welded rails to frame Rails are set 9" in from sides and extend 10" past end for handle. Clamps hold rails while I tack-weld them Complete welds aren't made until all joints are tacked

HERE'S A CORNER I had trouble with. I learned later just to tack outside lightly, then lay main bead down inside of the angle where rod can't slip off. Note how you can rest the electrode right on the joint before starting the arc.



them back from the arc gap. By then you were often several inches away from where you were supposed to be welding. The new rods have an electrically conductive match head on the tip that fires up the instant you switch on the current Once started, the fused iron at the tip is

conductive, so the rod will easily restart at any point along its length

Holder helps beginners. Along with the special rod, the Lincoln people have developed a new electrode holder that helps people like you and me get started.

There's a switch built right into the



HEAVIEST WELDING JOB was joining 12" axle to 1/2"-bar wheel strut Using maximum current. I laid welds alongside both sides of axle in the strut crotch, then shipped job over to weld axle to both sides of strut from below.



tawn table is 17" high, a comfortable coffeetable height I used 14" wheels from a Planet Jumor cultivator (available for about \$3 apiece). Start with wheels since size will determine axle position and length of legs.

WHEN JOINTS ARE TACKED, table is turned right side up, all clamps are removed and welds are completed. This belps keep heat from warping and shrinking metal, which might happen if you finished each rout as you went along.





handle. This lets you place the electrode where you want to weld before turning on the current, instead of turning it on first and trusting to luck that you'll hit the right spot.

There's also an adjustable, rubbertipped leg fastened to the holder that can be run along the work to help guide the rod and keep it at the correct angle.

I hadn't solved for more than a few

Plate

Thickness

Inches.

3/64"

1/16"

5/44"

1/8" et.

thicker

Govge

14

10

How you can select the right

rod and current for the job

Electroda

Size and Color

Marking

5746" Red

5/64" Red

5/64" Red

3/32" Blue

Ten

Settings

4 or 5

4 or S

hours before I found myself dispensing with both the switch and the leg. But that's just what's so good about it, You can use the gimmicks to help you learn, then operate the holder as a conventional one whenever you want,

Lights out. When

you flip on the switch, the first thing you'll find is that someone has turned off every light in the house-that's the darkened safety lens you're looking through. What happens next will look like a Fourth of July Roman candle, seen from the wrong end.

The tendency is to jump a few feet backward and upward-or at least I did. But once you've gotten used to it, you'll be teaching Grandma to weld a hitch on the old buggy without any qualms.

Selecting the heat. Along with the new rod and holder, there's a new homesize welding machine, called the Lincwelder 100. It has six current taps, or "heats," that offer a range of from 50 to 100 amperes.

Using too little current results in poor penetration, as the pros say-not enough metal melted deeply enough to form a good, solid bond,

But my first trouble was too much heat. It was a corner joint, and the more

I welded, the more the metal just melted and puddled away. Then I really poured on the juice and did a fine job of welding a C clamp right into the piece. The joint, however, refused to stay stuck

Checking back on the instructions, I learned that I was melting the metal so fast that it was burning right through before it had a chance to fuse. When I switched to a lower tap. I found I could

> gradually build back the lost metal, almost like weaving a

patch.

That's the beauty of welding. While the fit should be as good as you can make it, you can correct sloppy joints with a judicious build-up of welding metal in the right

places. And if the first weld doesn't take, you can run another one right through it,

as many times as necessary.

Amperes

55, 63

75, 85

75. 85

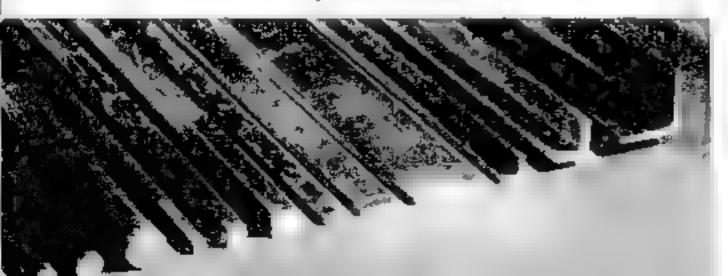
100

Chipping slag. The new rod leaves a somewhat thicker slag than conventional electrodes, and this must be carefully broken off with a chipping hammer before you can check the weld under it.

Occasionally, like me, you'll find a weld that looks great, but is actually held together by nothing but slag, which is roughly equivalent to spit in holding power. You must remove this slag before you reweld a joint or build up one bead on top of another, or the new welds won't take properly.

Precautions. In transformer-type jobs like the Linewelder, the working current is totally separate from the house current, so there's no chance of striking up an unwanted acquaintance with an oil burner, gas line or anything else you might accidentally touch with the rod.

The rod does spit hot, molten sparks,



ASSORTED STEEL, now available at hardware stores, makes it easier for everyone to work with metal. Kits include flat, round, square and angle stock from ¼" to 1".

For the lift-out tray, I chose a piece of fancy expanded metal

though, and you should work in as fireproof a place as possible. The best bet is a clean, dry corner of the cellar or in

a masonry garage.

It's long, it's low, it has wheels. The thing that started all this was a casual remark by my wife about wanting some sort of lawn table to put out on the terrace. In the stores, what the prices didn't do to scare me off, the designs did.

Most commercial tables are so high you have to sit bolt upright in a straightback chair to reach them, which isn't my idea of relaxing on a sunny summer day.

What I wanted was a table I could reach while reclining in a lounge chair, moving as little of me as possible.

The result, I think you'll agree, is something you won't find in even the fanciest stores, yet it contains only about \$5 worth of wood, \$10 worth of steel, and took less than two days to make.

Making the table. It is essentially just a 4'-square frame, made of \$" steel angle, that supports a wood deck. The deck is made of ordinary two-by-fours cleated underneath and spaced \$" apart so that water will drain off quickly.

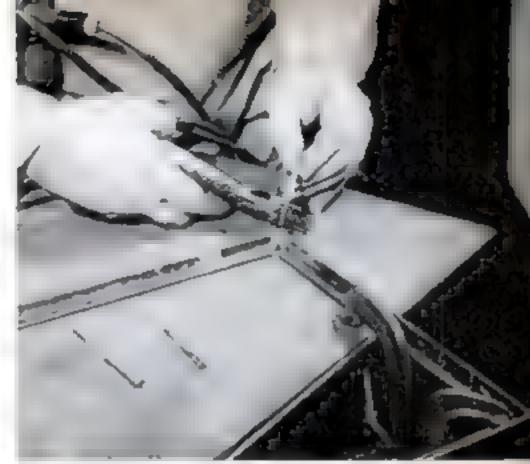
Two heavier rails of 1" angle are welded to form the undercarriage. The wheel struts and legs are bent up from "-square stock and welded to the rails.

Pounding with a heavy hammer, I found I could gradually bend the %" bar, but I don't recommend it as an easy

way to form stock.

Up to X", solid rounds and bars will bend fairly readily, but beyond this I'd suggest heating the stock first. One way to do this is with a carbon-are torch, available as an accessory for the Linewelder, which can also be used for hardsoldering and brazing. Or you can hacksaw the parts to size, then weld them in the desired shape.

When I was all finished, I surveyed the table and thought: "Boy, am I going to have fun relaxing this summer!" Then I took a look at the welder and thought: "Am I going to have fun welding!" END

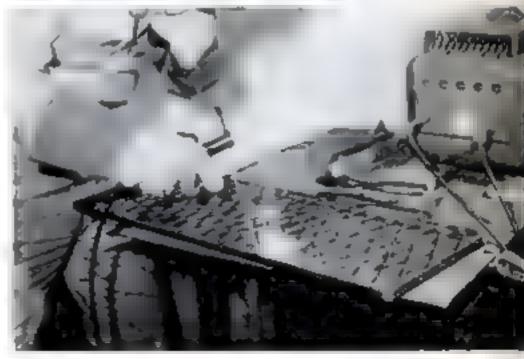


THAT'S A BAD GAP in that corner joint, but I learned how to fix it by welding in a short piece of electrode to fill the crack Tray frame is made from \$2" angle Handles are bent up from \$1/16" round stock



AS CUTTING TORCH, welder makes short work of shong section of expanded metal for the travbottom. We clamped on a length of angle for a guide, then drew the leg along the angle so that the rod made a neat, straight cut

tray frame without burning the thin strands. I used small rod, lowest heat, and aimed the electrode mostly at the frame metal. Giving each strand only a short burst did the trick.



Working Model of Atomic

Twin screws make this facsimile of the Nautilus skim through the water.



By Roy L. Clough Jr.

WHETHER you exhibit her on a trim display stand, or send her planing through the water with decks awash, this 18-inch model of the world's first atomic-powered ship is bound to be an eye-catcher.

Her dynamically simple hull is relieved by just enough fittings to give her the grimly efficient look of her big sister. Better yet, an ingenious twin-screw drive puts the atom-size sub through her paces with an authentic fan-tailed wash. Her rubber-band engine is as silent as a nuclear reactor, and while her cruising range is limited, she travels at fasterthan-scale speed. To build your Nautilus model, either scale up the plans on the following pages or send for a full-size blueprint (see free offer). After tracing the side, top and cross-section outlines on thin paper, glue the tracing on cardboard and cut out a set of patterns and templates.

Hull construction. For your powered model, you'll need a split hull, so you can carve out a cavity for the propulsion unit. Use two blocks of soft, dry pine, both a bit over 18" long and 1%" wide. The lower block should be 13/16" thick, and the upper one 15/16".

Stick the two blocks together with mucilage, so they can be parted easily



PROFILE OF THE SUB is marked out on hull block (two pieces of pine glued together).



HULL BLOCK IS SHAPED with a fackknife, tising templates frequently to check contour.



after the hull is shaped. Use the top and side patterns to outline the hull on the wood, and jigsaw the sub to rough shape. Then, checking with the templates as you go along, whittle the hull to final contour with a jackknife and smooth with sandpaper. Carve the conning tower from a separate scrap of wood, and dowel and cement it in place.



AFTER SANDING, hull halves are parted so interior can be scooped out with a gouge.

Finally, split the two hull sections apart and scoop out a cavity that will leave a shell approximately "" thick. Drill holes through the deck section to vent air when the model dives.

Propulsion unit. A glance at the detail drawing shows the simple gear arrangement which makes one rubber band drive the two propellers, turning them in opposite directions. You can salvage gears of the type shown from old alarm clocks and pick up the wire shafts and brass bearing tubes at any model store. Because most clock gears have large center holes, you may have to bush them by rolling a scrap of shim brass around each shaft before soldering the gears in place.

Now solder the bearing tubes to the tin tail assembly, taking care that they bring the gears to a good mesh.

The propellers, which are about twice scale size, are cut from tin stock. Twist



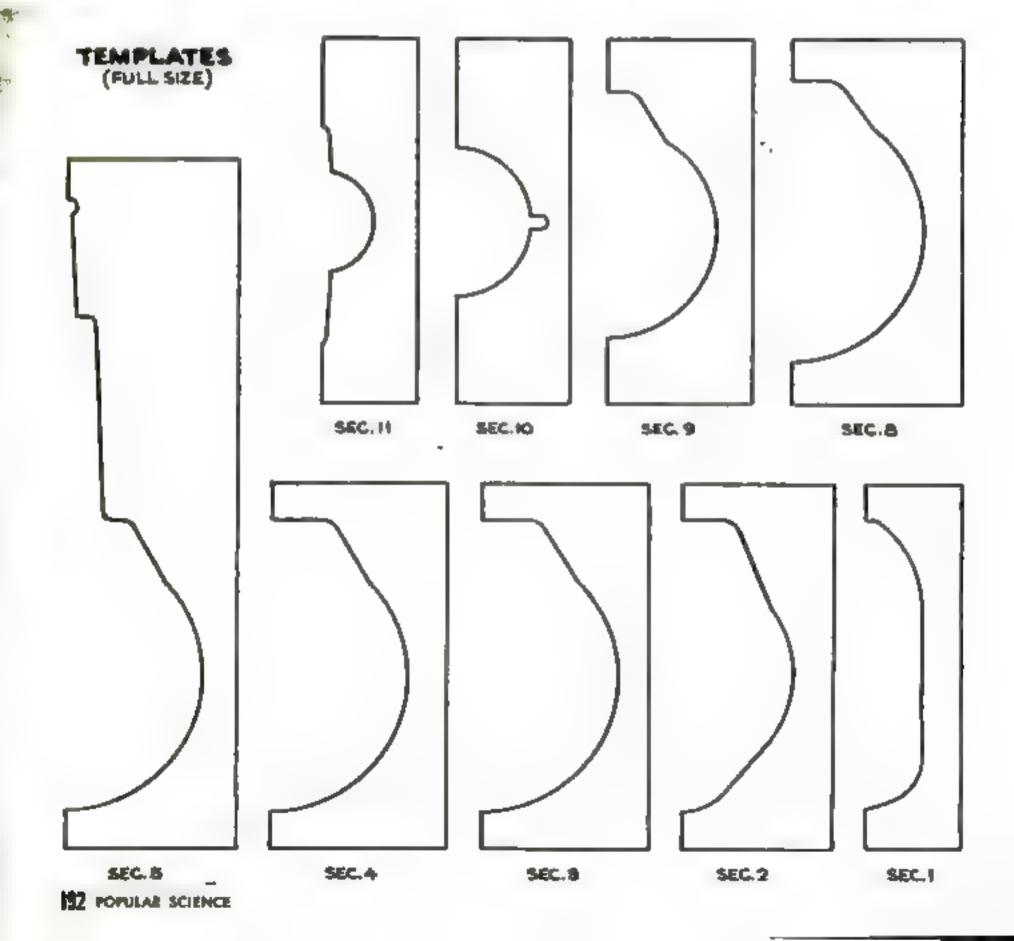
WITH TAIL ASSEMBLY ATTACHED to hull, gears are rechecked for nonbinding action.

PLASTIC MODEL PAINT is used for detail painting. Base coat is sprayed-on lacquer.

the blades of the two props in opposite directions to compensate for their counter rotation. Slip a cardboard washer over the shaft projections before soldering the shafts in place. Otherwise you may stick the shafts and bearing tubes together. Tear off the cardboard after the solder sets and you're ready to

cement and brad the tail assembly to the top section of the hull.

At the bow end of the same hull section, drill a hole to receive a winding hook made of thin spring wire. Form the hook first, then slip the wire through the hole from the inside and bend a crank at its outer end. Friction will keep this



winding book from turning as the engine (a loop of %" flat model-plane rubber)

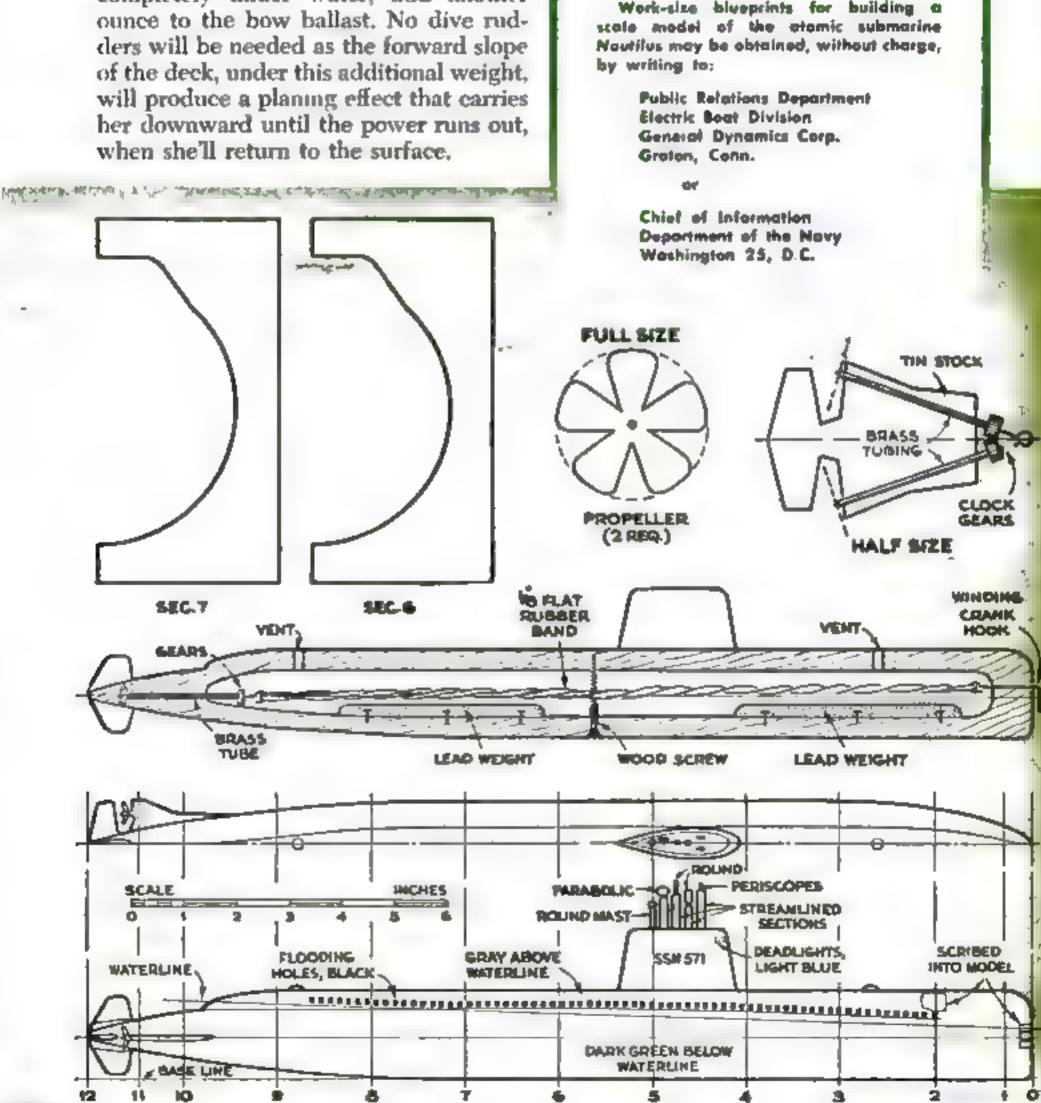
spins the props.

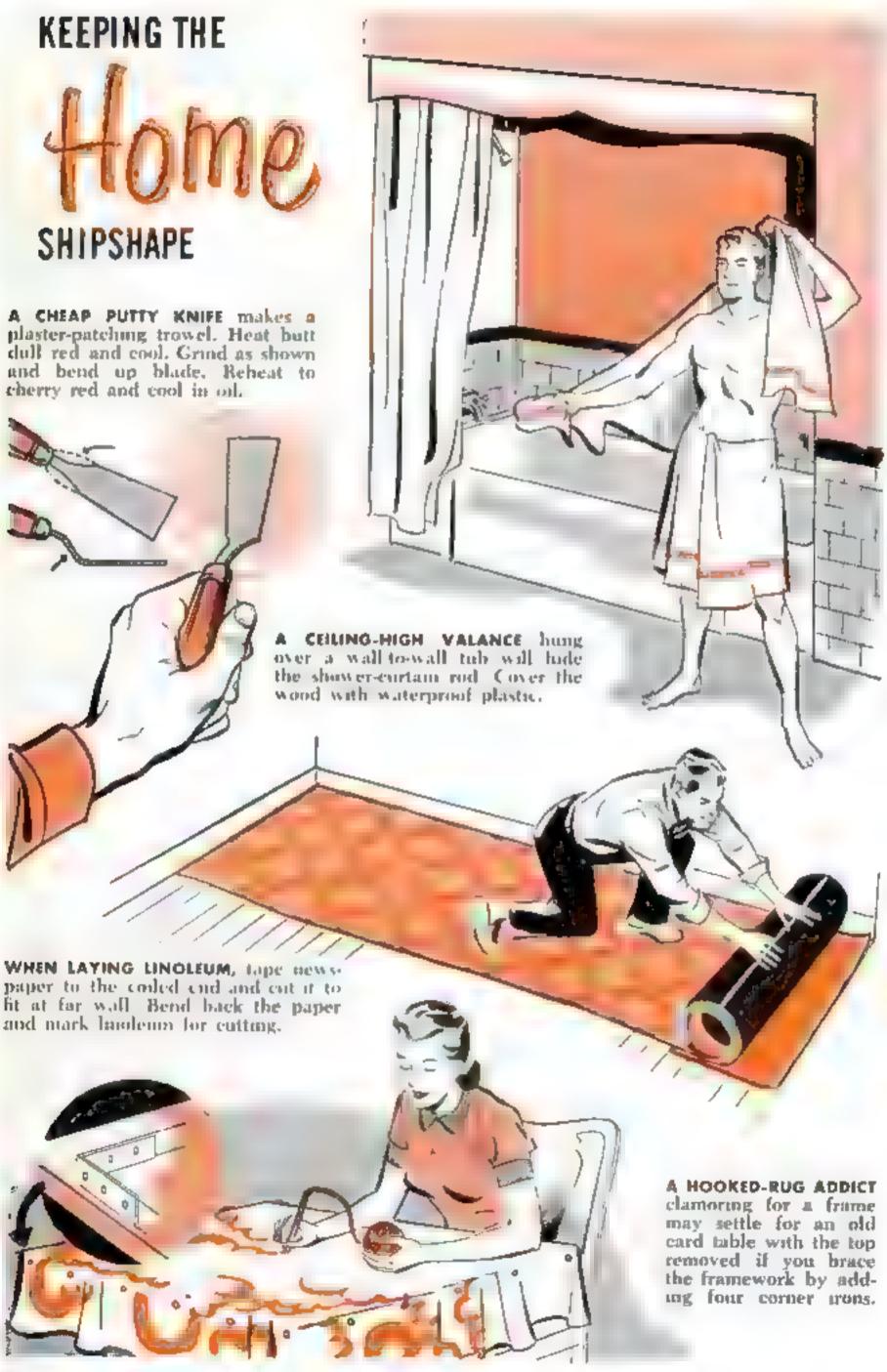
Ballasting. To make the model operate at proper depth you must ballast it with lead or babbitt. Push a few pins into the lower hull section, fore and aft, and pour in enough molten metal to give the half-hull a total weight of 13 oz; with the balance point coming about halfway between cross sections 5 and 6. With this much ballast, your model should run with her decks just awash.

If you want to make her dive and run completely under water, add another when she'll return to the surface.

Final steps before commissioning. As shown in the drawings, a flathead wood screw holds the two hull sections together. (They need not be watertight.) Mount the periscopes, radar and communications antenna on the tower and scribe forward diving planes on the hull.

Separate the hull sections again for painting. Follow the color scheme indicated on the plan and, for a flossy finish, use lacquer, rubbed down with steel wool.



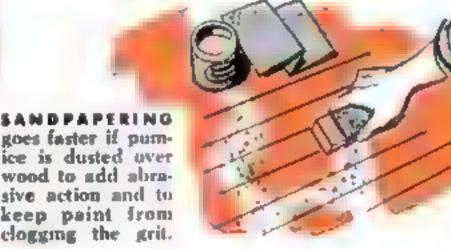




HERE'S A CLOSET-DOOR VALET to hold clothes and pocket contents neatly overnight. It's just a lipped shelf, with a hanger (hook removed) fastened underneath on a spring-loaded hinge so it swings up when unused.



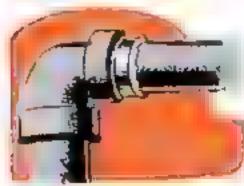
FOR SMOOTHER-GLIDING sliding doors apply a thin coat of shellac to the tracks and the wood strips that ride them. When dry, rub with paste wax.



goes faster if pumice is dusted over wood to add abrasive action and to keep paint from clogging the grit.

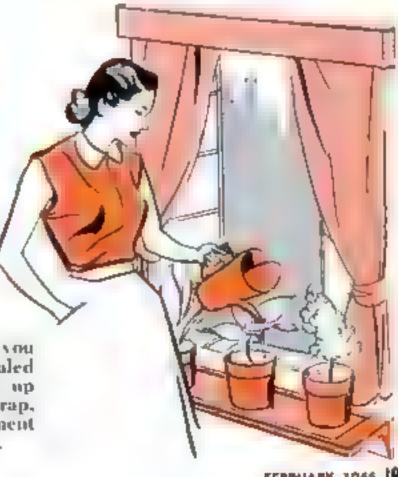


NEED A PUPPY BARRIERT A shithing with dow screen will keep your living room out of bounds to a pet. Attach it with hooks and eyes so it can't be nosed aside



A LEAKY PIPE FITTING YOU can't unscrew can be scaled with iron cement built up 14", Bind with a pipe strap, calking under it so coment expands tight as it dries.

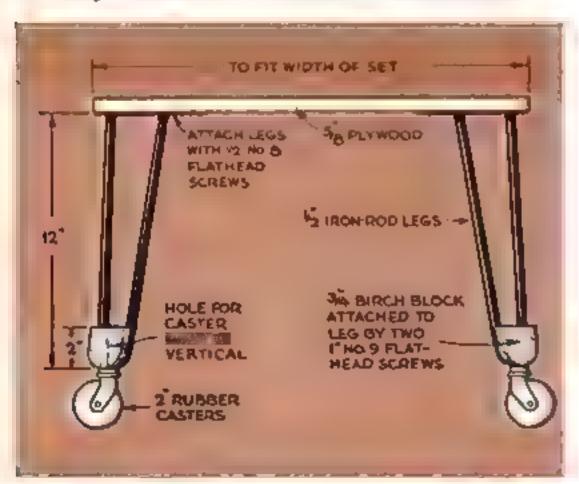
WINDOW-SILL GARDENING won't ruin the paint if the plant pots are parked on a protective coaster. Cut a rubber stair tread to fit the sill and paint it to match the wood.





How to Put a TV Set on Wheels

Easy-rolling casters and iron legs let you swivel your table-model TV around in any direction without a turntable.





PARTS REQUIRED are four hatepin legs with support plates, 2 rubber easters, hardwood blocks for holding casters to the legs. It you prefer not to fasten the legs directly to the TV cabinet you'll need a sheet of plywood, too



2 SHAPE CASTER BLOCKS to the curve of the legs and attach them with screws, after dedling holes in the legs Since legs set at a slight angle, be careful to hore holes for the caster shafts so they are vertical to the floor



3 ATTACH LEGS to plywood platform with 12" No. 9 flathead screws. The table and caster blocks can be painted flat black to match the iron legs. Legs suitable for the job are now widely available at low prices.—John Rogers.



Under fluorescent sunlight, seedlings and plant cuttings develop good healthy root systems.

Cold winds may blow and the snows drift high—but you still can enjoy

Gardening in the Wintertime

By W. O. Hawley and R. F. Dowdle

BY USING fluorescent light, you can garden the year round. You improve on nature by providing spring growing weather even in the dead of winter. With the flip of a switch you produce more hours of daylight than are found on a cloudless summer day.

You can bring delicate, exotic house plants to full maturity on a basement bench. Shrubs and vegetables get a head start while the outdoors is still in the grip of a freeze. They form strong roots, ready to take hold as soon as the soil can be turned.

Unlike incandescent lamps, a bank of fluorescents can be brought close enough to cuttings and seedlings to provide required candle power without danger of scorehing. Horticulturists at the U.S. Plant Introduction Garden at Glenn Dale, Md., have had success with daylight tubes in starting seeds and with white tubes for both seedlings and cuttings. Botanists at Rutgers University prefer the white tubes in all cases

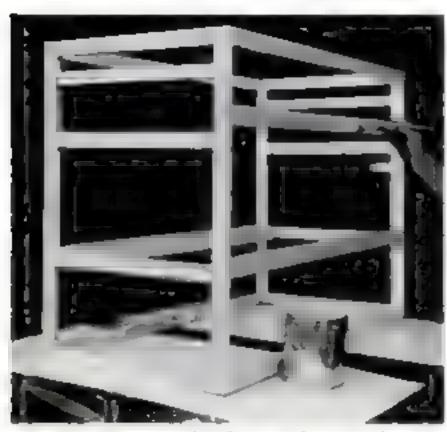
If your basement is warm and humid, hang one or more banks of two fluorescent fixtures 10" to 16" above flats placed

Mr. Hawley and Mr. Dougle are assistant hart, already a the Dicision of Pan E of calon and in come an Agricultural Research Service I S. Deportment of Agricultural

on a bench, and turn them on for 15 or 16 hours a day. If your basement is like most—either too cool or too dry—you will need a starting box in which temperature and humidity can be controlled

The closed case illustrated was built of secondhand materials and odds and ends at a cost of about \$25. All new materials should bring the cost up to not much more than \$50.

Design and construction. Over-all dimensions may vary according to the size of the fluorescent fixtures used. Two parallel 30-watt tubes and fixtures fit well in a case 3' high by 4' long, while the lips of galvanized-metal flats can be held easily on the front and back rails of a box 2' deep. The 40-watt fixtures measure 52" and require a unit up to 5' or 6'



INAMELED WHITE, the frame of a simple case for starting plants is ready for covering with tempered hardoard. Use one-by-two redwood, or cypress stock, treated with wood preservative.

TWO FLUORESCENT FIXTURES on movable wood bases serve as artificial sun. Gloss-white interior surfaces intensify illumination. You can use an ordinary light bulb for heating.

long. If wooden flats are preferred, fit them with hips on the upper edge of the ends and make their length and the depth of your box correspond.

Make the framework of redwood or cypress stock treated first with a wood preservative and then assembled with butt joints. Install one pair of the upper end crosspieces with the top edge 12" above the planting-stage rails and the other 18", so that the fluorescent tubes can be placed 10" above the flats for seedlings and 16" for cuttings. In the lower position they provide about 500 foot candles of illumination, and in the other between 100 and 200.

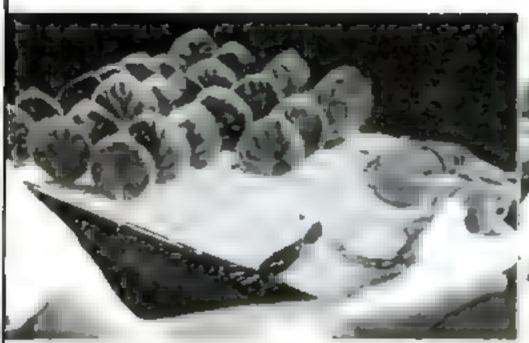
For the top, walls and bottom, use a material such as %" tempered hardboard. Attach to the frame with brass screws at close enough intervals to prevent leaking of heat and moisture.

The planting stage should hold the flats close together in order to trap the heat in the chamber below and enable concentration at the bottom of the rooting medium. If you remove any of the flats while the starting case is in use, cover the space that is left vacant.

Bottom heat, controlled by thermostat, may be supplied by one or more electric bulbs or a 75- or 150-watt sealed heater. Such a heating unit, designed to fit a standard socket, may be obtained at an electrical supply house for a few dollars. If properly installed, an inexpensive heating cable would give a still more even heat distribution. Pans of water on the floor of the heat chamber help to in-

SEALED HEATER warms the rooting medium here. Disperse its heat and protect it from drippings with a shield. Central thermometer and thermostat wands permit accurate control.





CUTTINGS ARE ROOTED by sticking the ends in a rooting medium of sand, vermiculite, peat moss, or mixture of these, drenched and drained. Subsequent watering is seldom necessary.

crease the humidity through evaporation. do wel

Rooting cuttings. After preparing the flats with a rooting medium of coarse builder's sand, greenhouse vermiculite, peat moss, or mixtures of these materials, well watered and drained, dust the cuttings with root-inducing compound and stick in shallow trenches. Place the flats in the case and set the thermostat for a temperature of 72° F.

Seed germination. Among the many garden plants you can start from seed are tomato, pepper, cabbage, lettuce, eggplant, cucumber, zinnia, marigold, aster, sage begonia, pansy and petunia.

Sphagnum moss is considered best for seeds, but excellent results may also be obtained with vermiculite. After placing the seeded flats in the case, you may want to cover them with sheets of glass to hold in the moisture. Most seedlings

YOU CAN BUILD YOUR OWN junction box to consolidate electrical connections from one lead. Mount a switch and indicator light on it to control the fluorescent circuit.



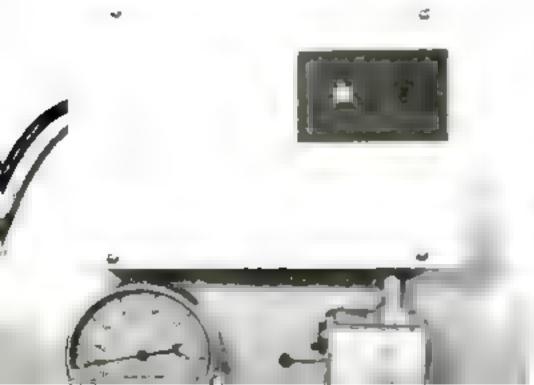
SPHAGNUM MOSS is a good medium for seeds because of its fungicidal protection against damping-off. Shred it through ¼" mesh, pack in firmly, water well and drain before planting.

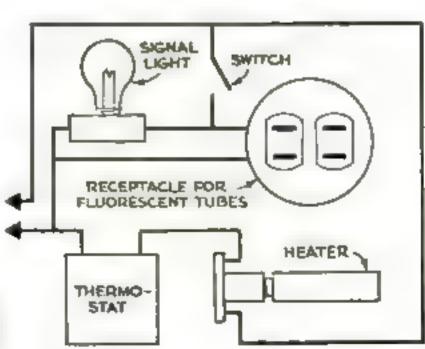
do well at temperatures of 60° to 68° F.

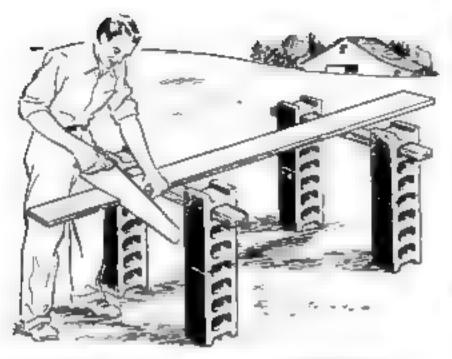
Transplanting. Several days before transplanting, you should open the door slightly and leave it in that position to provide ventilation and thus lower the humidity. Lower the temperature also by adjusting the thermostat, and take every precaution to acclimate the plants slowly to normal growing conditions.

Although it is possible to maintain some plants in the starting case for long periods, it is not designed to meet the requirements of most maturing plants. You can avoid disappointments by limiting its operation to the starting of young plants, and transplanting them as soon as they are well rooted. If it is too early to move them outdoors, keep them for a while in pots on an open bench with your fluorescent fixtures strong up above them.

HERE IS THE WIRING DIAGRAM. The heating unit, regulated by thermostat, is constantly on, while you give the plants light at desired periods. A time switch would be a convenience.

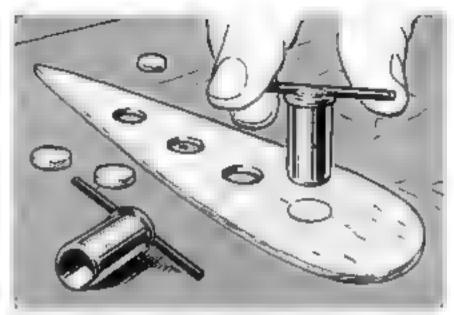






Blocks Serve as a Sawhorse

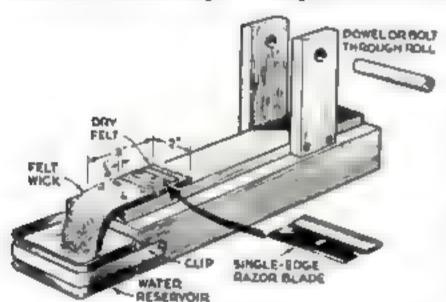
EMERCENCY sawhorses can be made from concrete blocks. Place two-by-fours through the holes as you see above. For a low sawhorse, you need only four blocks instead of eight.-Ted Otsu, Vancouver, Can.



Used Shells Will Cut Holes

Usen cartridges of the straight-sided variety, in various cabbers, make excellent hole cutters for thin sheet-balsa bulkheads and wing ribs. Solder a piece of wire on the cap end for leverage. Twist the other end of the cartridge in sandpaper to produce a cutting edge.

Homemade Tape Dispenser Includes an Automatic Moistener

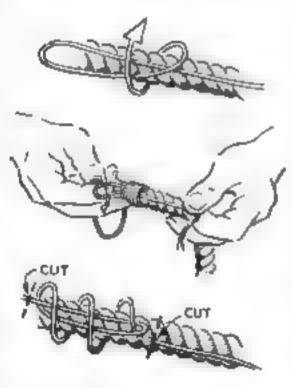


IF a holder for a roll of gummed tape is needed in a hurry, you can make one from a few scraps of wood. Use a fairly heavy piece, such as a bit of two-by-four, for the base. A piece of felt forms a spring cushion under the single-edge razor blade and protects the fingers.

For automatic moistening, fasten a container to the base and tack down a lampwick in front of the blade, separating it at least " from the dry felt.-George Walton,

Sharonville, Ohio.

WHIPPING ROPE



Keep rope ends from raveling by whipping them with cord.

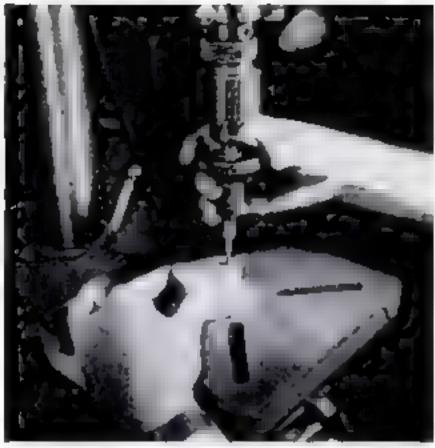
 To whip a rope, loop a section of cord and hold it firmly against the side of the rope, with the loop extending beyond the rope end. Then wrap the long end of the cord around and around the rope and the loop, spiraling it in the same direction as the rope strands.

2. When the tightly drawn cord spiral has nearly reached the end of the rope (from 1/2" to 1" away, depending on the diameter of the rope), pass the end of the cord through the projecting section of the loop and

pull it tight.

3. Pull on the short, or inner, end of the cord until the original loop has been drawn completely through the spiral to the starting end. In doing so, it doubles a second loop of cord under the spiral. Cut off both ends of the cord close to the spiral and you will have a firmly anchored whip.

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE



1. Drill Press Speeds Tapping. Chuck this tapping tool in a drill press or lathe and you won't have to struggle to hold it and turn it at the same time. The tap is guided straight and true, while you simply rotate the tool to cut the tap-in. Interchangeable holders take different size taps, and holes in the edge of the knurled wheel permit inserting rods when extra leverage is needed for tapping larger sizes.

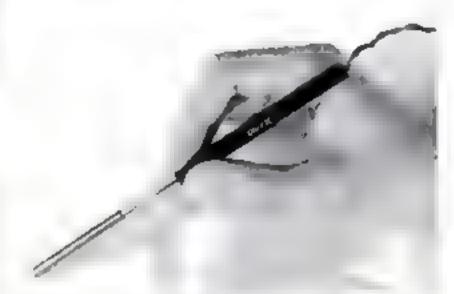


2. Pilers Hold Cut Wire. A rubbery plastic cushion on the cutting edges of these pliers grips the short end of wire as the paws close, holding it as the cut is made. This feature keeps flying snips of wire from falling into a radio or TV chassis or possibly injuring an eye.

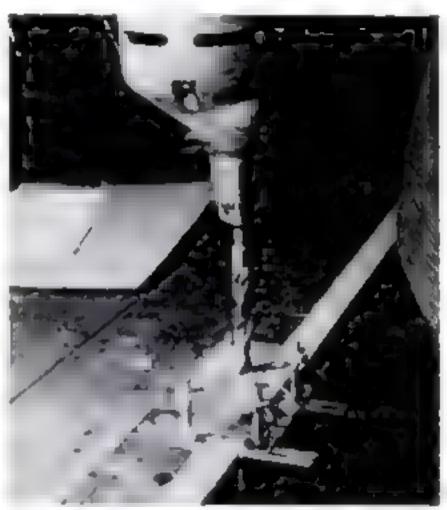
3. Gauge Measures Pipe. Matching a piece of pipe can be a headache. You get the inch-measurement of your pipe, then buy that size to find that it doesn't fit. With a new metal gadget, measurements are keyed to notches. The edge shown in use (below) is for common pipe from %"; the other is for use with tubing.



New Tools X



4. Tiny Tool Solders Small Work. Designed for those who work on delicate equipment, the 6" miniature soldering iron above weighs half an ounce. The lead-pencil-size instrument, imported from England, heats up in about 30 seconds.

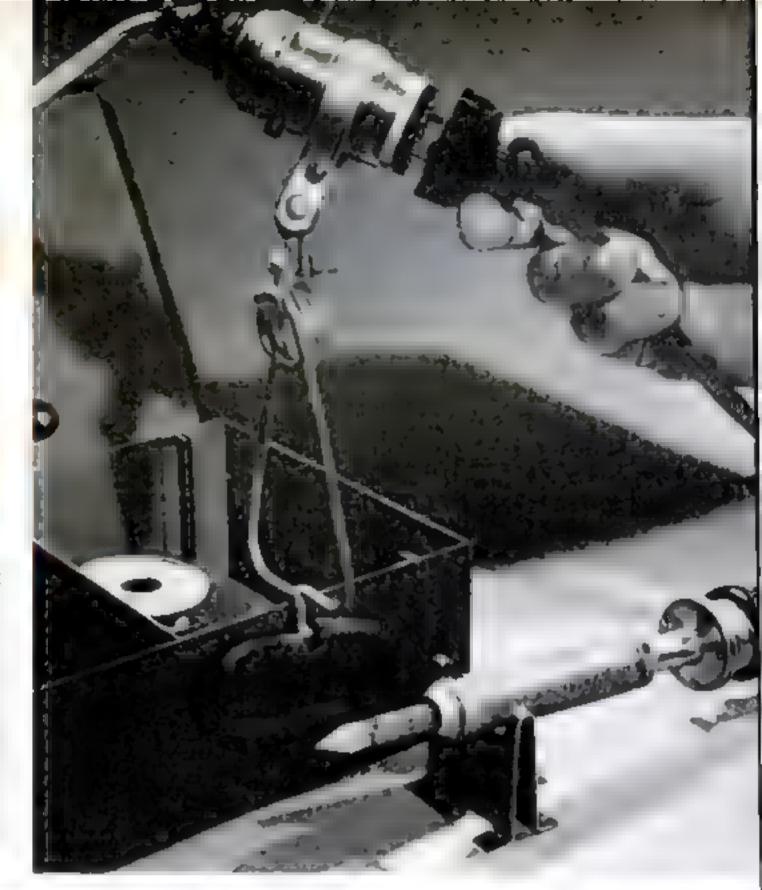


5. Jig Quides Hand Drill. The accuracy of a drill press is claimed for this device which can be clamped to any flat or curved wooden surface to make straight and accurate holes for doweling or screwing. The µg, which is made of case-hardened, cadmium-plated steel, has side gauges and depth control to make sure that holes drilled are uniform. It has openings for holes from 1/16" to 3".

Farther information on the tools shown on this page can be obtained from 1 E & G Engineering Co., 6004 firster St., Chicago 34, 2 Linea Forge & Fool Carp., Chica 1 N Y; 3. Langdon Products, Sox 6001 Hopkinton Mass., 4 Infectional Accessories Co. Box 6001, Arlington 6, Pa., 5, Mikin Products, Inc., 568 Linua Acc., Broaklyn II, N.Y.

Electrical Tips For the Handy Man

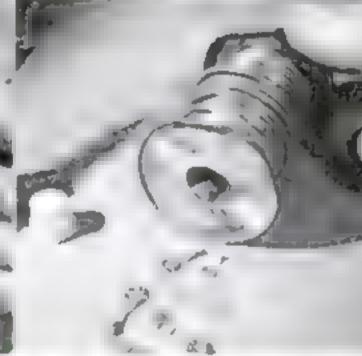
CLAMP can be made easily by fitting the wire with a spring-type clamp it provides an electric outlet fixed in place right at the job. You will had it especially handy when used with a soldering iron. Just clamp it to the toolbox or edge of the workbench and you will have it within convenient reach when you want it.





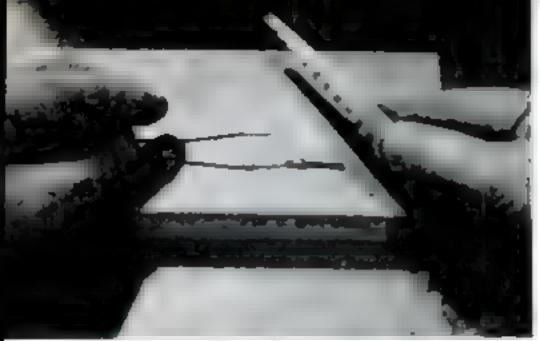
4 from exposed building posts of electrical parts such as the capacitor shown here, cover the posts with rubber nipples like those used on automobile distributor caps. You buy the nipples at garages.

pig-TAIL LEADS add much to the appearance and utility of electrical connections. You can coil one neatly by winding wire on an oil-can spout The diminishing spout diameter enables you to wind coils of various sizes.

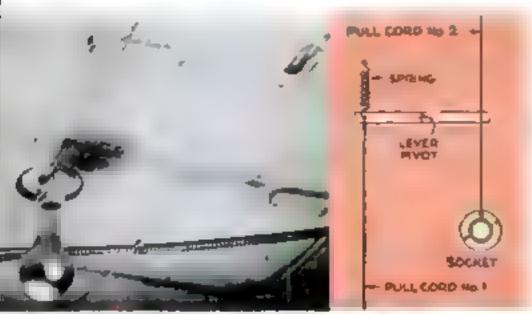


be where you want them when you want them if you store them inside the hollow core of the spool on which the solder is wound. Use corks as stoppers, or turn pieces of dowel to fit into each end.

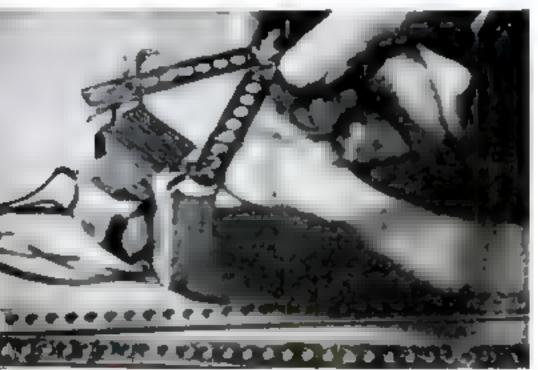
202 POPULAR SCIENCE



2 LACKING A WIRE STRIPPER, or when a manufactured stripper will not grip the smaller sizes of wire, you can do a quick, neat job with a hacksaw blade. Lay the end of the wire on a bench or piece of wood and press the teeth of the saw blade into the insulation. A quick, sharp tug on the wire will strip off the required amount of insulation.



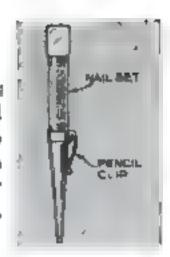
3 A LAMP IN A PULL-CHAIN SOCKET can be controlled from opposite sides of the room by a lever-and-cord arrangement like this. A coil spring keeps the first cord taut.



7 A JIG FOR DRILLING MOUNTING HOLES can be made from two perforated metal strips from an Erector set. Join them at one end with a bolt, lock washer and nut. You adjust the jig to match the mounting holes in an electrical part, as seen here, and then transfer it to the mount or chassis where the hole centers are prick-punched for drilling.

Nail Set Clips Just Like Pencil

A NAIL SET will always be handy when needed if you slip a pencil clip over it. You can then carry it easily in your pocket.—W. B. Eugan, Floyds Knobs, Ind.



Acid Sharpens Tool Burrs

Diller cutting burs of electric hand grinders can be revived somewhat by dipping in acid. First clean the tool in acetone and let dry. Then, for a few seconds, dip it into dilute hydrochloric acid or tinner's fluid. Wash the acid off in a solution of baking soda and water. Again dry thoroughly, and oil lightly.—

R. L. Clough Jr., Bristol, N. H.

Staple Supports Glue Brush

Your glue brush won't pick up dirt or mess up your workbench if you solder a stuple to the top of the can and rest the brush there.—H. C. Kenly, Short Hills, N. J.



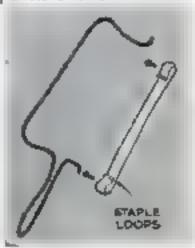
Star Drill Removes Pipe

ONE way to unscrew pipe you can't get at with a wrench is to insert a star drill a little larger than the pipe diameter. The flutes should hold tightly on the inside. Use a wrench to hold the drill shank and back the pipe out.—D. S. Halacy Jr., San Diego, Calif.

Wire Makes Saw-Type Sander

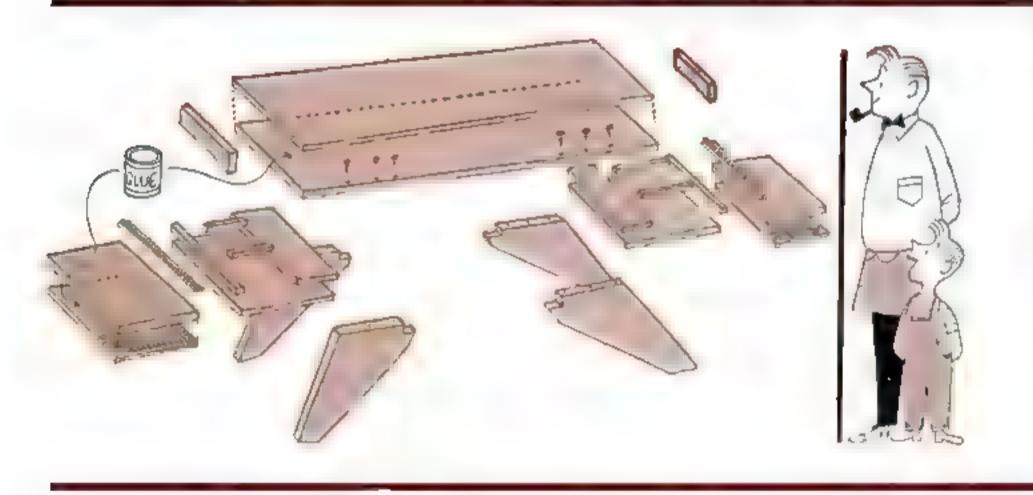
BEND a scrap of heavy wire to copingsaw shape, staple loops in the ends of a

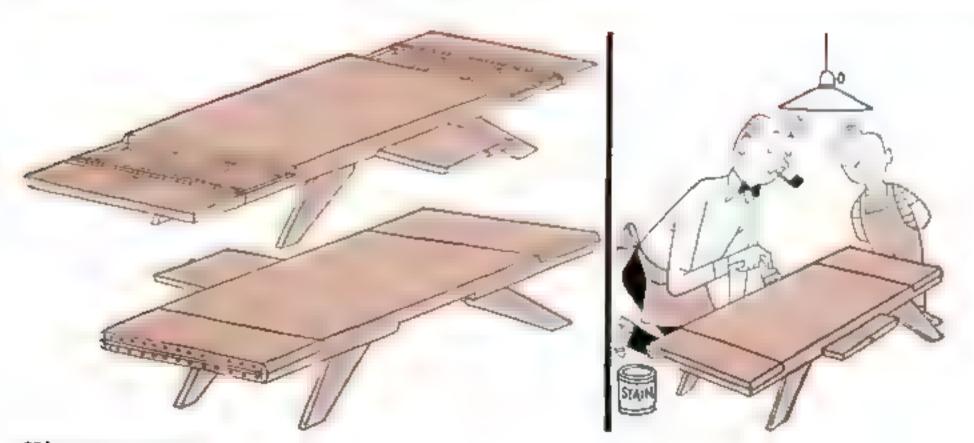
strip of sandpaper and you have a handy little belt sander for smoothing rounded shapes. Small ones can be made from conthanger wire. Heavier wire gives more rigidity in spans over 5",

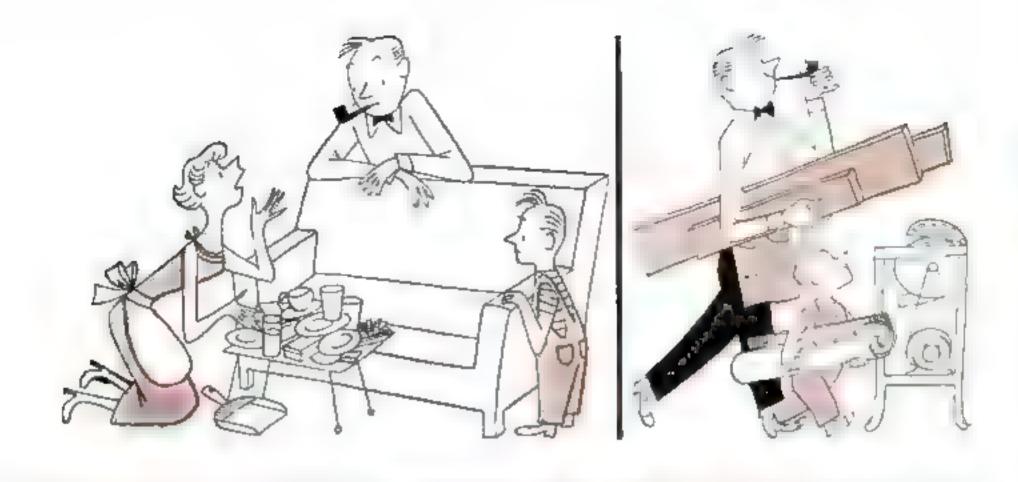


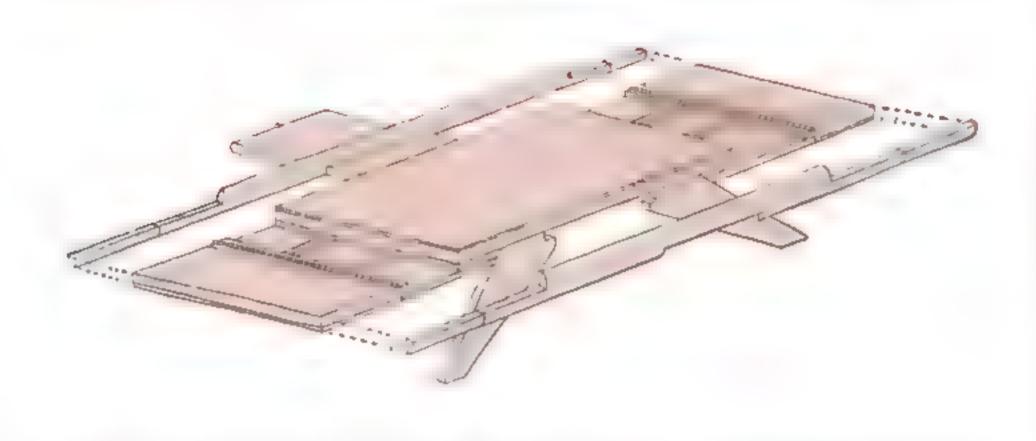
Wordless Workshop













Next Month: A wall desk that files your bills, too

FEBRUARY 1955 205

What You Can Do with

By Henry B. Comstock

WANT to put a tough and handsome metal finish on a wooden model or toy? Need some small castings, strong enough to be machined and tapped, dense enough to take a mirrorlike polish? Looking for a filler that can be smoothed to a feather edge? Stymied by a patching problem—possibly a cracked aluminum casting?

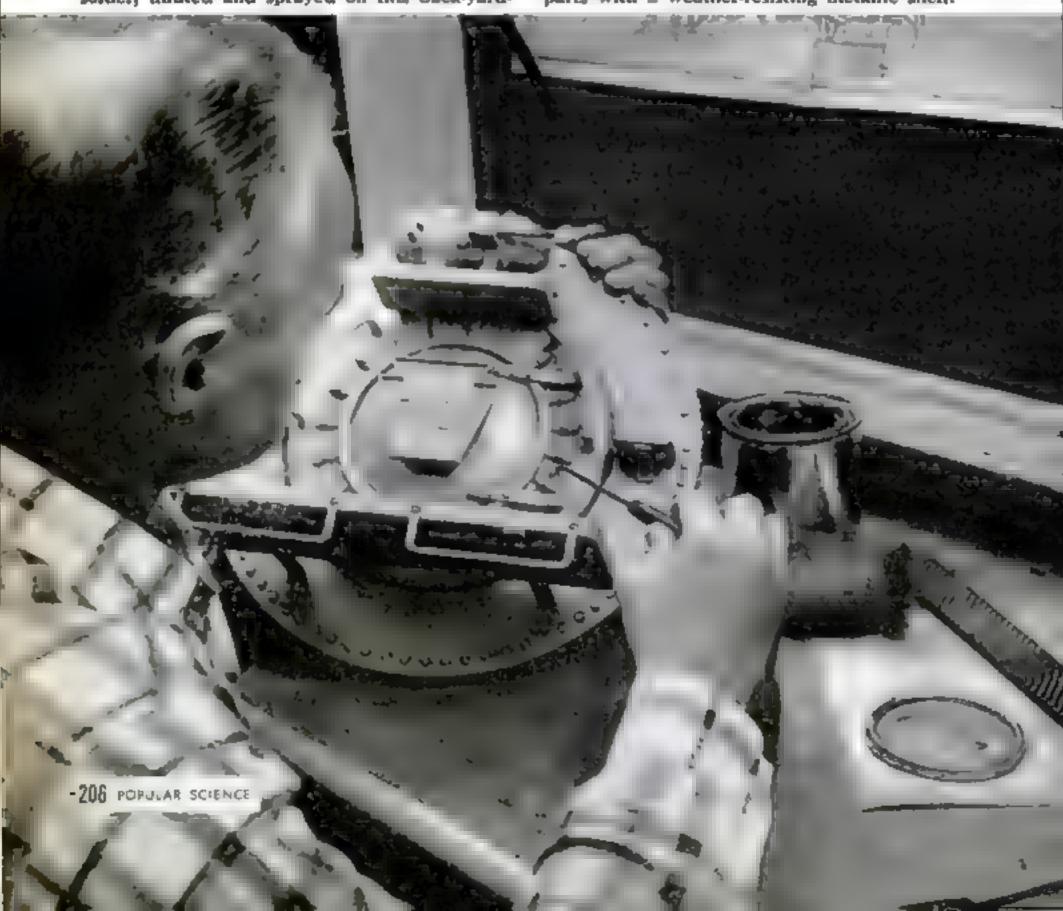
Then it's time you latched onto metallic cold solder, the versatile paste now being used, industrially, for everything from mending auto bodies to making sturdy dies, molds and patterns.

HARDENING WOOD PARTS. Aluminum cold solder, diluted and sprayed on this back-yard-

What metallic cold solder is. Sold under a dozen or more trade names, metallic cold solder is basically iron, steel or aluminum powder, mixed with a plastic bonding agent. When you apply the puttylike compound to practically any material and expose it to air, the solvent in the plastic evaporates, leaving a hard, grim-gripping material that you can file, sand, buff and even machine.

Some manufacturers also offer metallic cold solder in liquid form; others sell special thinners to dilute the paste. Either way, you can handle the thinneddown product with a brush or spray

railway locomotive front, has coated its wood parts with a weather-resisting metallic shell.



Cold Solder

Hard-drying metallic pastes are made to order for new projects and many old repair problems.

gun, to put a durable metallic surface on metal, plastics—or what-have-you

Models. For model and craftwork, your best bet is a cold solder with an aluminum base. Although the hardened turned or tapped it works more easily than iron or steel compounds. In paste form it can be molded as readily as clay For very thin parts you should shape the



MODELING. You can shape small metallic parts from cold solder. Press the paste over a wire or tin-stock frame, let it harden, and finish with files, sandpaper and steel wool.

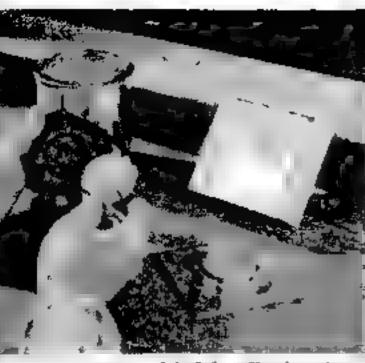
SPRAYING. A model car-truck side gets a prime cont of lacquer-thinner-diluted cold solder. Paint, whether enamel or lacquer, sticks without trouble to the metallic undersoat.

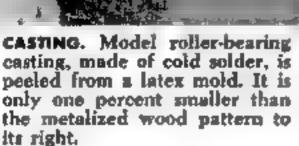


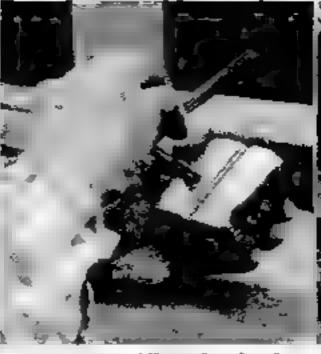
TURNING. This miniature ship's bell was turned from maple, given several coats of Hydrallov (a liquid-aluminum cold solder) and then turned again to produce a high gloss.

METALIZING. Want to give that solid wood airplane model an authentic burmshed-aluminum finish? Again, cold solder does the trick. It's also good for feather-edge filleting.









MACHINING. Allowed to harden in an open can, this block of metallic solder was drilled, tapped and halved, revealing exceptionally sharp threads and no friction beautiful.



MENDING CASTINGS. Widen cracks with V cuts and apply metallic cold solder with a putty knife or spatula. File down surplus material when the paste sets.

material over a wire armature—not for final strength, but to support the paste until it sets. Once hard, the model can be refined with pattern files.

Painting. In liquid form, aluminum cold solder is a natural for metalizing solid-wood models, toughening wood or plaster patterns, or for putting a hard, weather-resistant surface on toys that are to be used outdoors. You can even simulate rough sand castings by applying a heavy mix with a spray gun.

Don't expect wonders when you first brush or spray the liquid on your handiwork. It will dry to a dull gray finish, with no hint of the handsome luster that buffing and polishing bring out. Allow 20 minutes between spray coats, and from three to four hours for a brush job. To clean your spray gun or brushes afterward, use lacquer thinner or the special solvent supplied by the manufacturer.

Casting. Although aluminum solder is too expensive (about \$2 a pound) to be used for large castings, you can make sharply detailed miniature parts from it by letting a liquid mix cure in an open-backed latex mold.

For the best results, make the mold half again as deep as the thickness you want in your casting. Pour in enough creamy—not watery—compound to completely fill the mold, work out any air bubbles with a piece of wire, and set aside to harden in a well-ventilated spot. In drying, the solvent will evaporate, giving you a casting that will vary in thickness, depending on the ratio of solids to solvent,

If the part is too thin, leave it in the mold and back it up with more compound. This won't weaken the final product and no part of the second pouring will creep around to the face because shrinkage, other than through evaporation at the back of the mold, is almost negligible.

Patching. You can use any one of the metallic cold solders to mend cracks and broken sections in metal castings. Whatever type you use, clean the area around the break before applying it. Widen thin cracks by grinding a deep V groove along them; then trowel in a little more than enough cold solder to fill. Let the compound set, and file flush. Use the same treatment to unite broken sections of castings. In that case hold the parts together with clamps or connecting pins while the material bardens.

When filling large gaps, start by bridging the open section with wire screening, anchored to the back of the casting with a thin coat of compound. When it is firmly bonded, build up enough that layers of metallic paste to restore the original contour.



Bike Wheels Make Mowing Easy

WHEN a neighbor developed heart trouble and found his self-propelled power mower too fast, he made a simple conversion that enabled him to push easily and rest at will, complying with the doctor's orders against overexertion.

He disconnected the propulsion unit and substituted 20" bicycle wheels with inner-tube tires for the original wheels. The large-diameter wheels provided greater maneuverability and easier control.

Forks made up of scrap pipe and elbows were drilled for the bicycle-axle bolts. They were then attached to the mower base with floor flanges and tie rods.—Harry J. Miller, Sarasota, Fla



Splinters Pulled by Cotter Pin

IF you run a splinter into your hand while working in a shop, you can form emergency tweezers by bending a cotter pin like this.—Robert B. Ryan, Los Angeles.

Perfume Traces Furnace Leak

If your furnace is a hand-fired air system, you can check for leakage of combustion gases into the ducts by throwing a small capped bottle of perfume on the fire and closing the door and all controls. If there is leakage, the smell will be noticeable upstairs when the bottle explodes.—Stanley E. Kwela, Fond du Lac, Wis.

ALMANAC

FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.



battery's soul. Reduce heavy drain when the engine is off or idling, and keep a comfortable level of distilled water above the plates.

►► Take a leaf from the man who once wondered if the refrigerator light really went out. Glove-compartment door unlatched? Trunk ajar? Courtesy lights on? Will the hattery be dead tomorrow?



▶►Take a close look at the dipstick some morning when the engine lusn't been running for some time. If you see signs of stratification, with black

oil below and a watery clear band above, it won't hurt to drain.

>>icy ruts are wicked on front-wheel alignment. If you must travel mich roads, gentle your front end by being light-hingered on the wheel and by keeping the speed down.

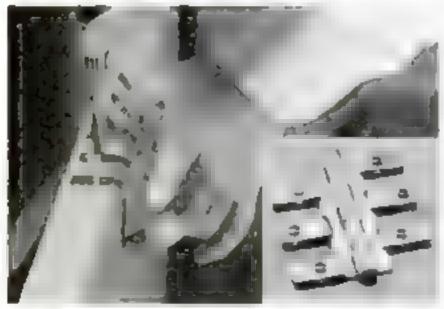
▶▶ Heater getting miserly with its calories? If the thermostats are working right, check the heater radiator for fluff, or see if the blower-motor bearings don't need a drop of light oil.





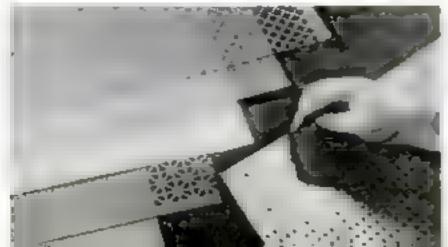
VeW for the Handy Man

1. Locking Shingles Resist Wind. An asphalt-shingle strip combining the interlocking feature of the familiar diamond type with the butt design favored by most homeowners is now being offered for the first time. A tab at the center of each butt locks into a slot in the shingle below, to prevent lifting. The interlock also insures fast and accurate aligning of strips and saves nails.



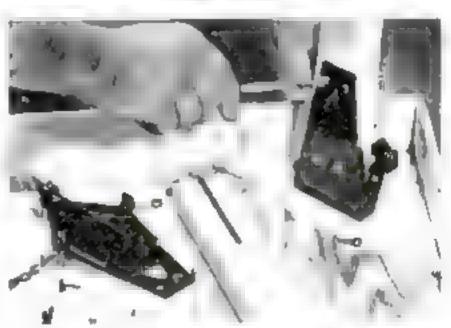
2. Hinge Needs No Mortising. A new type of hinge, husky enough to hold a heavy door, can be installed without cutting mortises Screwed directly to the door edge and jamb, the staggered leaves telescope into a single thickness of metal when closed. A non-rising nib holds the pin in place. The hinge comes in several finishes.





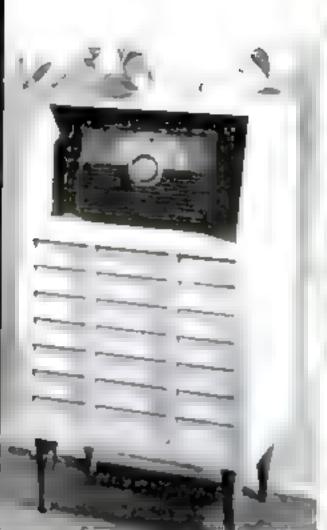


Won't Clog. A light-weight shower head that won't corrode and does not allow lime to build up is being manufactured of nylon resin. It has standard threads, a shower-spread plate and shutoff valve.



5. Hinges Make Fold-Away Legs. You can make your own folding eard tables, ironing boards and benches with the simplest hand tools, using ready made hinges of a self-locking design. Once attached to the furniture, threaded holes and jamb nuts assure permanent adjustment.

Further information on the products described on this page conbe obtained from 1 Ruberord Co., 500 F fth Ave., NYC 36; 2. We know Mfg. Co., 1"15 Liverpool St. Pittsburgh 33, Pa ; 3. Revealds Metals Co. 1500 S. Third St., Louisville, Kv.; 4 Fatten Magnason Co. 152 E. Atosta Ave., Glendoru, Catif.; 5. Buston Mfg. Co., Milwankee.



WHAT BURGLAR would think of looking for a safe behind what appears to be the speaker panel of this console radio? The panel is held by secret catches that are easily released by those who are in the know.



With this handsome cabinet, you double your protection against burglary loss by

By Glenn A. Wagner

YOU can sleep soundly at night and leave home for business or a weekend with a clear conscience if your family valuables are hidden away in a secret safe.

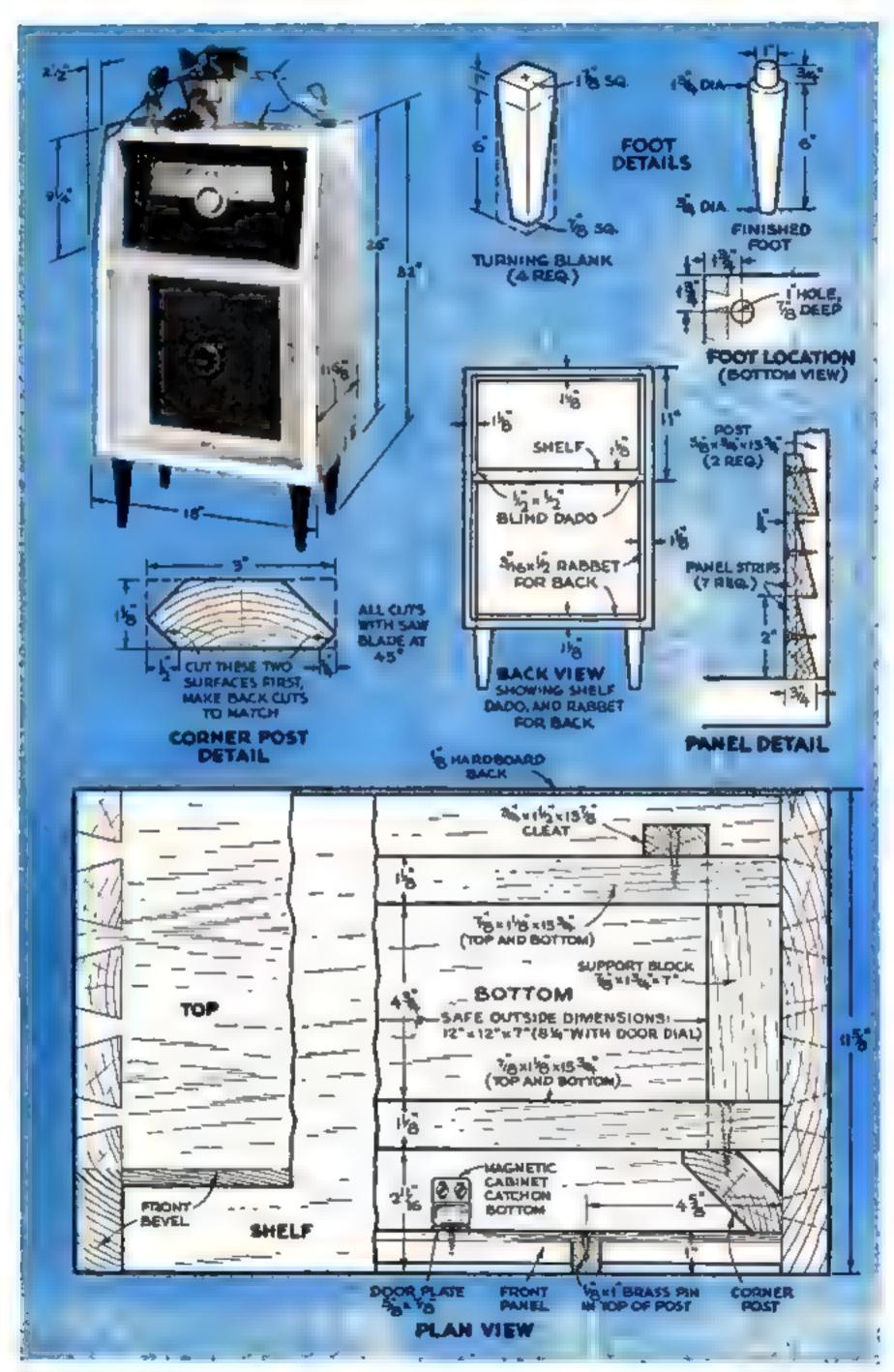
The pièce de résistance—and we mean resistance—is a small, regulation wall safe built into a tailored cabinet. Such a cabinet will make a handsome console of your table radio and fit into almost any decorating scheme. Its secret-panel door will defy a burglar's search and, even if

discovered, the husky safe is constructed to withstand sledges, crowbars, explosives, fire and furniture movers.

The safe is locked in by construction. Its weight combined with that of the unit itself makes the piece too heavy to be moved out bodily without attracting the attention of neighbors.

I used clear pine with black walnut legs for my cabinet, Cherry, maple, birch, mahogany and oak also work up well.

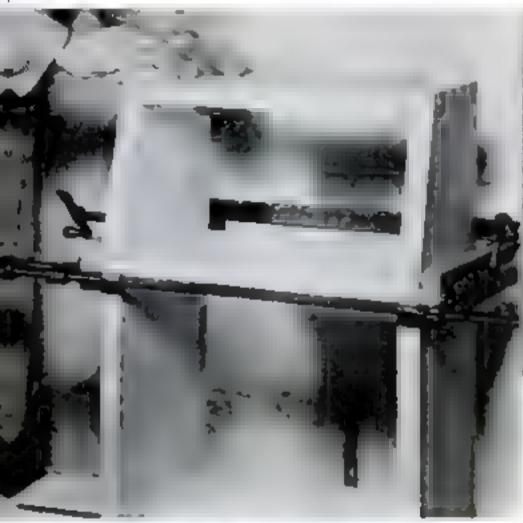
For the details of how to build the cabinet, see the following four pages.





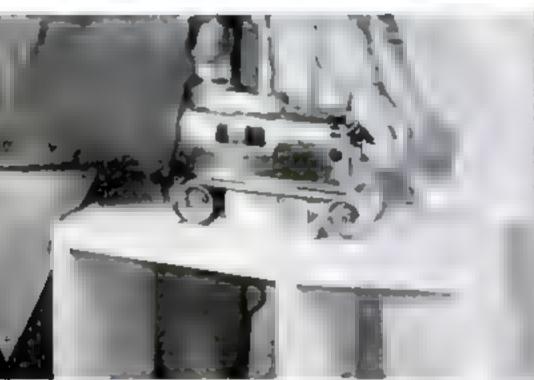
1 BEGIN CONSTRUCTION of the cabinet by laving out ½"-by-½" blind dadoes to support the shelf Use a stop block or mark the saw table to halt the cuts ¼" from the front edge.

2 MAKE A TRIAL ASSEMBLY to be sure that all parts fit snugly in place. Dovetail joints are used here at the corners, but blind dadoes or reinforced butts would do as well.





3 GLUE AND CLAMP the assembly after cleaning and sanding inside surfaces. Wipe off excess glue (left) with rag and hot water. When the glue has set, plane the outside faces true and square (above). Beyeled top front edge is laid out during trial assembly to the angle of slope of the upper section of the sides.



4 FIRST SANDING may be done with a belt sander, but you should finish by hand with 3/0 garnet paper. Wipe with a damp cloth and, when dry, remove whiskers with 6/0 garnet.

Safe. The corner posts act as stops for it and the front panel. Clamp the front assembly in place and screw it to shelf and floor.

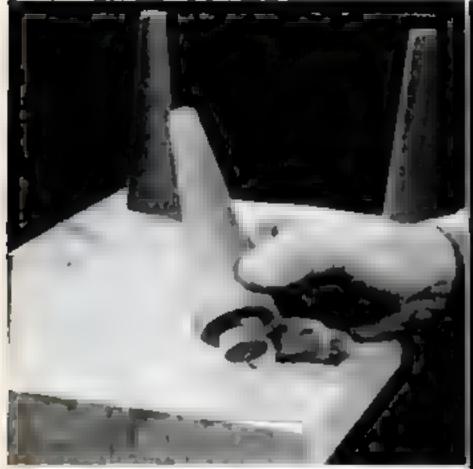


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6 TURNING BLANKS for legs, sawed to length and the ends squared, are marked for centers and start of the taper. Using a taper jig, cot off excess material on the circular saw.

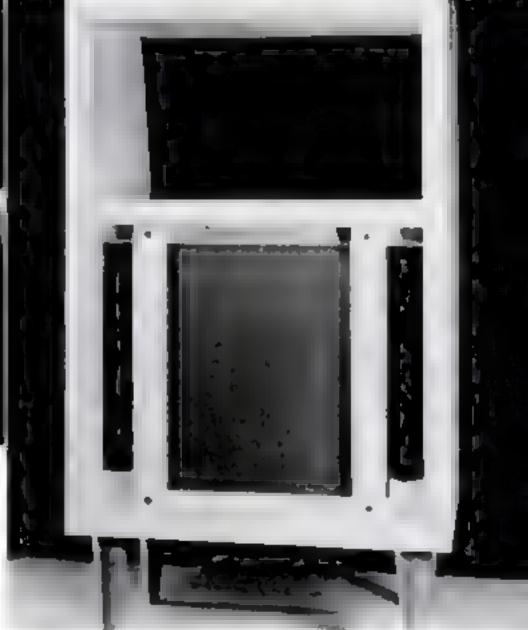
7 TURN THE LEGS with a tenon at one end to be a 1' round mortise, as above 5et the calipers by measuring the diameter of the wood bit you use for boring the mortises.



O and bore 7s" deep. If you cut the tenons 44" long, a flush fit against the bottom face is assured. Glue the legs in place.

9 WITH SAFE IN POSITION (right), anchor it with uprights, 5ide blocks hold it laterally. Note rubbets for the back, which should be slotted for the radio cord and ventilation.

10 DADO SEVEN STRIPS for the front panel to take vertical cleats. Bevel with the saw blade set at 15°. Cut the strips slightly long, and trun to a soug fit after assembly.



11 HELD AT TOP by two 's" brass pins and at bottom by a magnetic catch, the panel completely hides the safe. Become by pulling the bottom out, and then pulling down



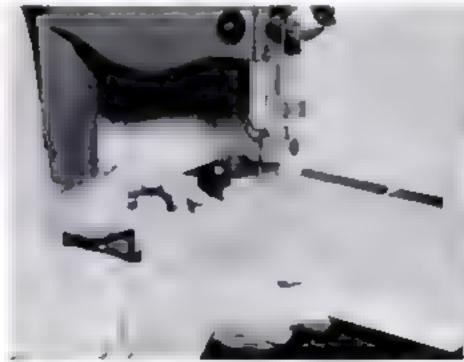
How to make a dovetail joint



MAKE THE PINS FIRST, sembing 15 angles for the sides on both faces. They should be as deep as the stock is thick. Set the saw also at 15. Turn the work for mating cuts.



GUIDE THE END CUTS with the rip fence while supporting the work from behind with the cross-cut guide. Make all cuts in waste. You will get smooth results with a hollow-ground blade



cinch if you use a bandsaw or ngsaw. Touch up any rough spots with a closel Further touching up for fit is done during assembly.



WITH MATING PIECES lined up flush, sembe sockets to match the sides of corresponding pins. Using a square, scribe both faces for guide lines marking the depth of the cuts.

SOCKETS ARE CUT BY HAND with a dovetail or similar saw having line teeth. Always cut on the inside, or waste side, of the lines and to exact depth to avoid gaps and squeezes. CLEAN OUT WASTE with 4" and 42 chisely, working from each face Undercut slightly toward center for a tight lit. Your devetails should then just glide together and lock. END





New for Your Car

1. Snowplow Bolts to Car. Designed for passenger cars, this one-man snowplow can be attached and put in use in a matter of minutes. Riding on a steel shoe, it carries its own weight as the blades push snow aside A secondary runner lifts the plow when you back. The mounting bracket is bolted to the car frame and can be left in place all winter without interfering with your driving.



2. Tappet Feeler Saves Hands. Angled ends on this set of feelers permit gapping valves on overhead-valve V-8 engines without placing your hands near the hot manifolds. The gauge, designed for current Ford and Mercury engines, has leaves ranging from .015" to .021".



3. What's the Temperature? A thermometer outside your car will give you the correct readings of outside air temperature as you drive. It can be clipped to the vent window of any ear,

4. Brake on Teen-Agers. A locking arm that prevents pushing the accelerator pedal beyond any set speed will keep teen-agers from endangering their lives in the family car. The device is bolted to the floor near the tip of the accelerator pedal, where its arm is swung into position and locked after setting for desired top speed. Unlocked, you can swing the arm out of the way for adult drivers. A sealed wire through a clip and cap screw gives you a check against tamper-



Further information about the products shown on this page can be obtained from. 1. Meter Products, Inc., 3649 & 82nd St., Cleveland, Ohio; 2. Rinck Mellicuine, Inc., 16 Hudson St., N1C 13; 3. Taylor Instrument Co., 93 Ames St., Rockes ter NT; 4. Dom Mechanical Corp., Thompsonville, Conq.

ing by the youngsters or their friends.





Easy Hookups Show Transistor Wonders

SIMPLE AMPLIFIE

Circuits that you can build demonstrate today's flashiest little gizmo in action.

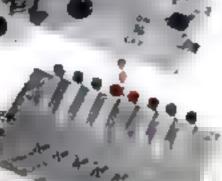
By Howard G. McEntee

ONE way to learn about transistors is to put them to work. The six breadboard layouts at left, all within a beginner's scope, demonstrate what these midget miracles can do. You can start with one transistor and a handful of parts, and later add other elements.

For instance, the receiver can be used alone for good earphone reception; adding the one-stage amplifier will provide modest loudspeaker volume. Hooked to a record player, the two-stage amplifier puts out your favorite platter music. With a midget speaker as a microphone, it will pick up baby's least cry and relay it to the bridge table, or serve as a one-way intercom.

A later article will tell how to build a code-practice

DSCILLATOR



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oscillator, an electric eye, and a midget electronic organ.

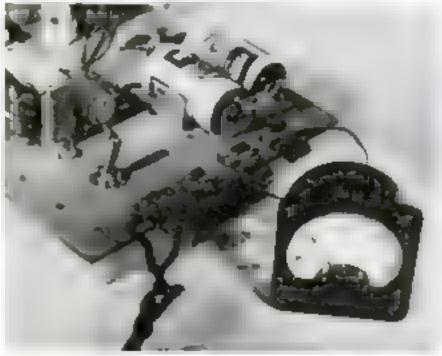
Built on pegboard panels, these units can be put together by eye. There are no holes to drill, no layouts to measure. Simply count panel holes on the drawings and mount parts accordingly.

They're here to stay. Transistors can already do almost everything vacuum tubes can, do some things better, and pull a few tricks tubes cannot match at all. At present, they are still expensive. But all the circuits shown here work with a surplus type, FS2500, available for less than two dollars each.*

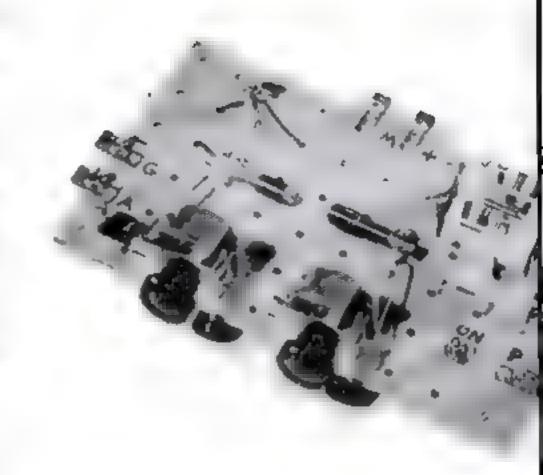
Like the early galena crystal used in cat's-whisker detectors, transistors consist of materials called semiconductors, among them germanium, silicon and selenium. The crystal detector and its descendant, the sealed diode, both used a chip of such material with a wire contact. The first transistors, called the point-contact type, were similar but had an extra cat's whisker. A later development is the junction type, in which the wire contacts are replaced by pads of transistor material cemented to both sides of a large crystal. All are, of course, sealed in metal, glass or plastic.

How do they work? Free electrons (electrons not tied to molecules) in the semiconductor travel through the material to constitute a minute flow of cur-

*All parts, including tested translators, sold by Federated Purchaser Inc., 66 Day St., NYC 7.



WHY BATTERIES LAST so long: Milliammeter on two-stage amphifier shows total draw less than one ma. If you have no meter, simply short meter clips with a wire jumper.



rent. They flow more readily one way than the other, so if you connect the base and either the emitter or the collector in a circuit, you have the equivalent of the older sealed diode rectifier or detector.

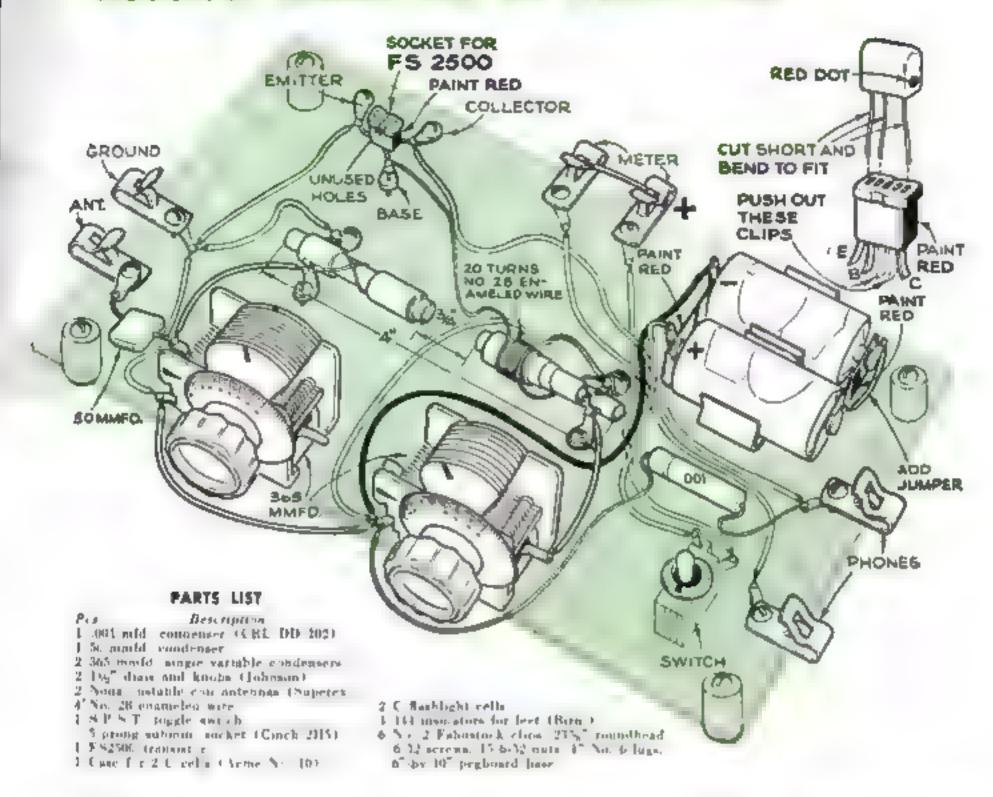
But what makes transistors immensely more important is that by applying a very small current to one contact, you can trigger a larger current through the other just as with a vacuum tube.

Electrons and holes. In manufacturing transistor material, the germanium or other element is first purified, and then tiny amounts of selected impurities are added. These convert the material either to one with extra electrons (called N type, for negative) or to one with insufficient electrons (P type, for positive). In this latter, a molecule lacking an electron steals one from its nearest neighbor, which in turn steals one from the next in line, and so forth, so that the "hole" travels just like an electron. A typical junction transistor will have a layer of P material sandwiched between two of N material. The FS2500's are of this NPN type.

With vacuum tubes, the triggering potential (input) is fed to the grid and filament; the output is through filament and plate. In the circuits shown, the transistor base compares to the tube

[Continued on page 262]

Receiver Makes the Air Waves Talk



LITTLE more complicated than a crystal set, this receiver has good earphone volume. Two loose-coupled tuning circuits separate even strong local stations. You will, however, require a good antenna. Where phone wires are strung on poles, good reception can be had by connecting the antenna clip to any bare metal on a telephone.

Mount the ready-wound coils (sold as loop antennas for superhet receivers) by soldering their terminal lugs to bolts set in the panel. Push the iron cores of the coils just flush with the facing ends (be careful not to lose either).

Leave the emitter disconnected at first. Temporarily connect the plus and minus terminals on the battery case, with no cells in it. With the switch on and a jumper across the meter clips, you should

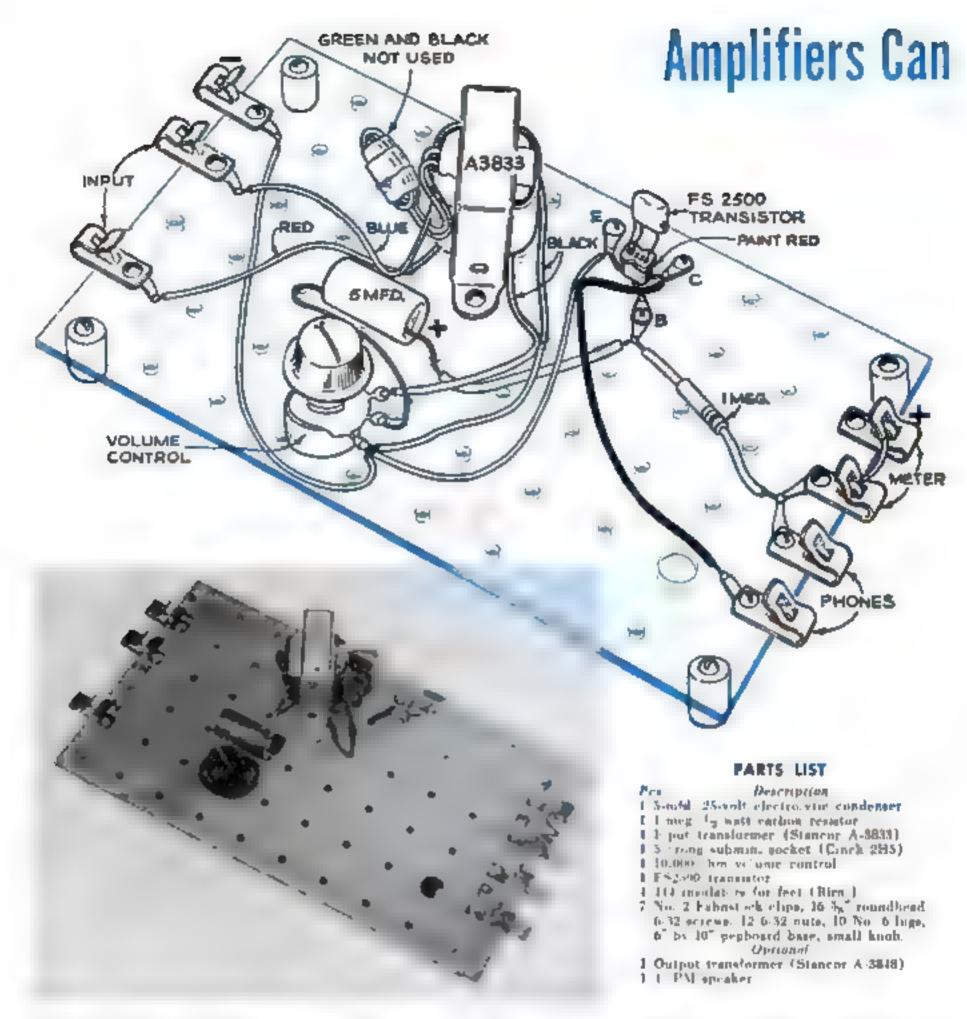
get reception, the transistor working like an ordinary crystal diode.

Now ground the emitter, disconnect the case terminals, insert two dry cells correctly (center posts toward red marks on case), and listen to the difference with the transistor working as a triodel

A meter should read less than ,1 ma. The condensers should tune to approximately the same dial setting. If strong stations overlap, reduce coil coupling by pushing both cores a trifle farther in.

If stations in your area are far apart on the dial, coupling may be tightened by pulling the cores out, with some gain in pickup. For still more volume, connect the amplifier shown on the next page.

Disconnect the antenna when the set is not in use, for in thunderstorm seasons static may damage the transistor.



HOOKED to the receiver, this single-stage amplifier will work a small permanent-magnet speaker on local stations. It needs no batteries of its own, but draws power from the receiver.

The input transformer specified was designed for another purpose, so one winding is not used at all. Simply tape both leads off separately, not joined.

Connect the input terminals of the amplifier to the phone clips on the receiver, and the plus and minus clips to the corresponding ones on that unit. If a meter is connected, it should show from .1 ma. to no more than 1 ma. Should it read more

than this, substitute a higher value for the I-meg, resistor specified.

Connect phones directly to the output terminals. A speaker, having a much lower impedance, should be connected through an output transformer as shown on the facing page. This can be mounted on the chassis, with the input leads left free so that they can be inserted in the clips in place of phones, or disconnected when phones are used.

For maximum volume, mount the speaker in a cardboard carton or on a foot-square baffle of plywood or fiber-board.

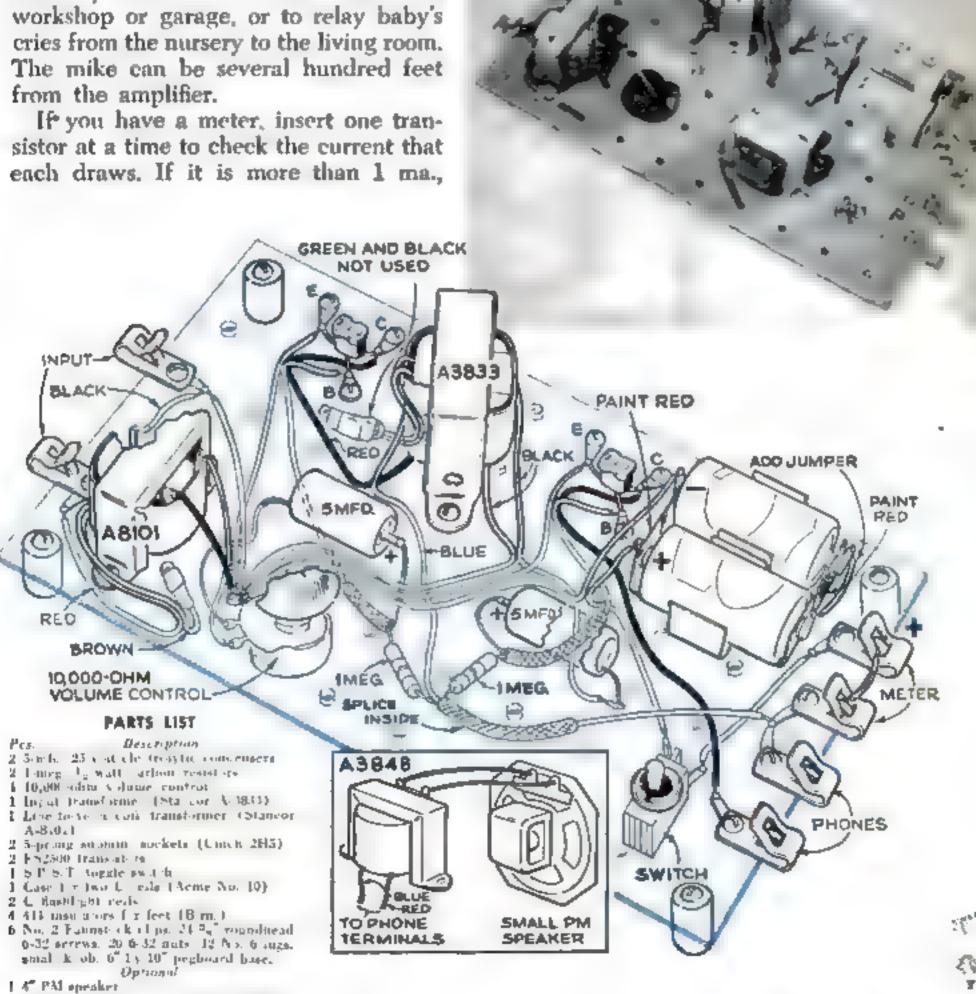
Be Used to Detect Sounds or Boost Volume

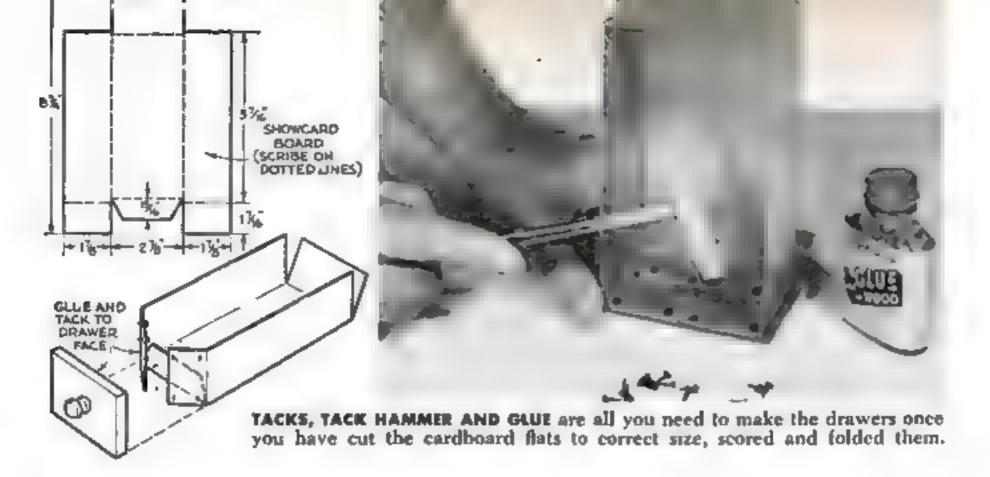
TWO stages of audio amplification make this rig a phonograph amplifier, intercom, baby listener or detectaphone.

To pick up air-borne sounds, a 4" PM speaker is used as a microphone. It has excellent sensitivity; when phones are used to listen with, even whispers can be heard. With a second speaker at this end, connected as described for the single-stage amplifier, the unit can be used as a stand-by intercom between house and workshop or garage, or to relay baby's cries from the nursery to the living room. The mike can be several hundred feet from the amplifier.

1 Output transformer (Stancor A-1818)

With a phono pickup, use a second A-3833 transformer instead of the A-8101 Connect the two black leads to the volume control. Try the pickup across each of the other two windings for best results.





Want a simple hammer-and-scissors job? Try

Making Drawers from Cardboard

A NOVICE can build this small-parts cardboard drawers. You trim them to a smooth-sliding fit with either a matte knife

or a pair of seissors.

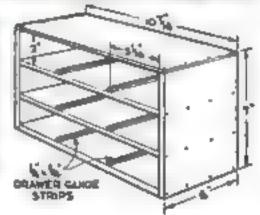
Make the cabinet first, using 1" pine for the base, %" plywood for the sides, and %" plywood for the back, shelves and top. Before assembling these parts with glue and brads, attach %"-square strips of pine to the base and shelves to act as drawer guides. Four rubber feet complete the cabinet prop-

er, except for painting.

While you may want drawers of a different size, follow the basic pattern shown in the drawing. A tin template will speed accurate cutting but isn't necessary. Use showcard board, available at all art stores, for the drawer stock. After cutting the required number of "flats," score them where folds are indicated with dotted lines, using a sharp knife and taking care not to cut too deep. The scoring insures accurate bending and sharp corners.

Fold away from the scored side and reinforce all joints and folds with binding strips of wide cellulose tape.

THIS CABINET of cardboard drawers was made to fit between two workshop shelves. You can make it larger, but if you increase the size too much, rigidity and sturdiness will suffer.



Finally, glue and tack an oversize face made from X" plywood to the front of each cardboard box and attach drawer pulls. For a finished result paint the drawers, or at least their outside surfaces, to match the cabinet. —Enc Adams

Tube Patch Makes Emergency Fix for Car Ignition Trouble

When my car conked out miles from a garage, I quickly traced the trouble to the distributor. The insulating fiber on the breaker arm had broken off, letting the arm short to the cam. Cutting a %"-by-%" strip

of tube-patching rubber, I cemented it around the arm, oiled the cam, reset the spark gap, and made it home—150 miles—without further trouble.—Edwin Kirchuber, Franklin Square, N. Y



NEW Shop Ideas

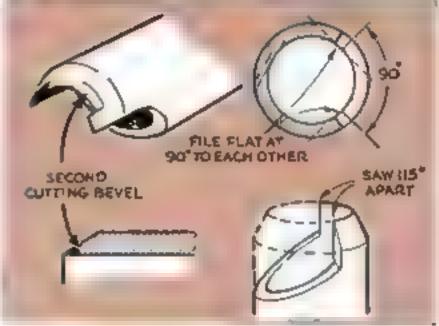
A SECOND BEVEL filed between the guide fingers forms the corner-cutting edge. The tool shank may be knurled or wrapped with tape for a good grip.

Corner Punch Aligns Itself. Making neatly rounded corners on cardboard, fiber, and soft sheet metal is easy with this punch. When placed against the edges of the work, it is automatically positioned. Each corner will be rounded exactly alike.

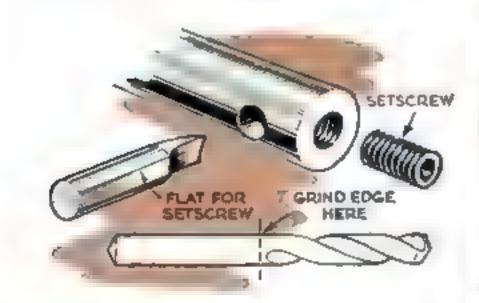
In one etcl of a piece of drill rod, drill a hole of the desired cornering radius and about %" deep. File or turn an outside bevel as for a hollow punch. Make two saw cuts 115° apart and about %" down from the etcl. Then cut from the side, removing all but the 115° segment.

In this, file a 90° section about 1/16" deep, leaving two projecting fingers. File the insides of these flat to form a right angle. Then file a secondary bevel between to form the radius-cutting edge.

Harden both ends of the punch and draw



the upper end to light purple and the lower to a light straw. Dress the edges with a fine stone, leaving the guide fingers sharp to penetrate the cardboard or other underlay on which the work is to be cut.—Walter E. Burton, Akron, Ohio.



Drill Yields Boring Bit. When a special boring bar is needed, you can skip making a square hole by grinding the bit from a broken high speed drill. Shape the cutting edge at that part of the shank where the flutes run out, it is hard and will hold an edge. Drill a hole the same size in the bar.—M/Sgt. James R. Wood, NYC.



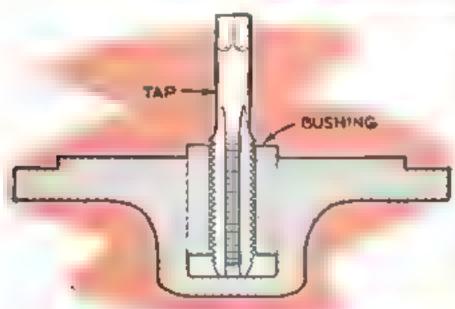
Oil Conditions Stones. If you store sharpening stones in a covered pan kept full of kerosene, they will always be clean and ready for use. The oil soaks out imbedded grease and metal particles, making the stones cut faster, wear more evenly, and put a smoother finish on edges.—H. L. Luckett, San Antonio, Tex.

MORE SHOP TIPS

Ensier Faceplate Mounting. With the faceplate horizontal instead of vertical, you
needn't be a juggler to mount
multi-pieced work, or jobs
that call for loose packing
pieces. A wooden fixture
holds the faceplate in the
vise at a handy height.

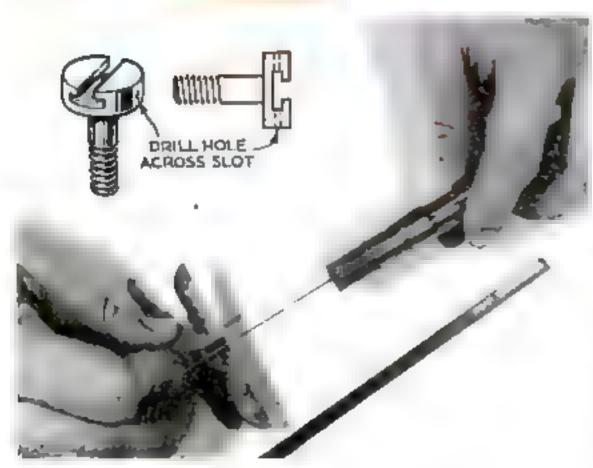
File opposite flats on a 6" length of 1%"-diameter hard-wood for clamping in a vise. Turn down the other end, if necessary, until the faceplate can be screwed on, cutting its own threads. Held as shown, it can be rotated at your convenience, and there is clear-ance under it for inserting bolts.—Joseph Tracy, NYC.





Pulling Blind Bushings. To remove worn bushings from blind holes, as in auto starters and generators, simply screw in a tap of suitable size. Any tap that will cut threads in the bushing will do. When it bottoms in the hole, the bushing will be forced out, if twisting stress doesn't free it first.

To Tap Edge Holes in sheet plastic or other brittle stock, clamp it in a vise with the edge flush with the top of the jaws. So backed, the sides will not break through.



Small-Hole Depth Gauge.

A rule depth gauge is limited in use to holes that will admit the blade. But I converted mine to gauge holes as small as 1/16". It took only minutes, and didn't affect the tool for ordinary use.

All that's needed is to drill a 1/16" hole in the slotted clamping head, crosswise of the rule-holding slot. Insert a 6" length of straightened steel music wire in this. Gauge holes with the wire, and then measure its projecting length with the rule.—Phil McCafferty, Stanwood, Jowa.



New wide-screen systems enable amateur to capture boy at left (on screen) and all of falls.

Wide-Screen Movies Come to the Home

New lens attachments that fit both your camera and projector squeeze Hollywood scope and realism into home-movie film.

By Herbert O. Johansen

PHOTOS BY W. W. MORRIS

O NE evening as we came out of the neighborhood theater after seeing a CinemaScope feature, a friend invited me to his house to look at some of his 16-mm, homemade movies.

He had some good family action stuff
—a Fourth-of-July picnic with a lot of
fancy fireworks, a parade in which Joanie
was a majorette leading the school fifeand-drum corps, the kids in a snowball

fight. But after the wide-screen movie we had just seen, his square projections looked flat and lifeless. I frankly said so.

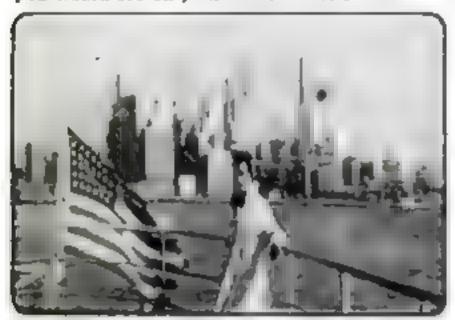
"Yes, I know," my friend agreed. "If I could only get on my film what I actually see while I'm shooting—that would be something!" A faraway look came into his eyes as he added, "Well, maybe someday amateurs like myself will get wide-screen movies."

"I got news for you, pal," I told him.
"That day has come."

"Sure, I know," he said. "If I could af-



NORMAL 16-mm. movie frame, in blowup, looks like this. The young lady leaning comfortably against the rail of a round-Manhattan Island eight-seeing boat has a nice skyscraper background. It is what the camera "saw" and what you would see on your home-movie screen.



SQUEEZED image of the same scene as above, but taken with a wide-picture lens attachment, looks like this. The Stars and Stripes gets into the picture—and there's lots more skyline background on either side, too. This distorted image, of course, is not what you would see on the screen during projection.

ford professional Hollywood equipment and had 'the back of a barn for a projection screen."

"That's where you're wrong. You can get a lens attachment right now that will give you wide-screen 16-mm, movies, It's FilmoRama, just put out by Bell & Howell. And there's another one, Vistascope, imported from Holland. That one comes in two sizes, one for 16 mm, and another for 8 mm."

"You mean I actually can take movies like CinemaScope?"

Same Principle and Lone as Pro Jobs

"As a matter of fact, FilmoRama works on the same principle as Cinema-Scope, which was developed and made by Bell & Howell."

"Yes, but what about showing what

I took?"

"Same lens attachment," I told him.
"Use it on your camera while shooting,
then put it on your projector. Like the
professional jobs, these are anamorphic
lenses."

"Anamorphie? What's that?"

"Anamorphic." I explained, "means that they see to the sides as well as straight ahead, taking in a wider scene—more like what the human eye sees. Then they squeeze the wide view onto the film. When you use the FilmoRama or Vista-



UNSQUEEZED by the anamorphic lens attachment used in front of a standard projector lens, the distorted image becomes a realistic wide-

screen picture. The new lenses see more, show more. All three photos on this page were reproduced from actual 16-mm, film.





scope attachments on your projector, the process is reversed, and the squeezed, distorted image is unsqueezed.

"With FilmoRama you get a picture almost three times as wide as it is high. Vistascope gives you 50 percent more horizontal coverage. You'll need a wide projection screen, of course, but it doesn't have to be curved."

"Sounds like the stuff all right," said my friend, "What's the price tag?"

"Depends on which one you want. The FilmoRama wide-screen lens attachment is \$596. Then you need special mounting brackets, one for your camera and another for your projector. Also, you must have a special wide-field view finder. That adds up to a \$760 package."

"What about that other one?"

"Vistascope. Well, there aren't any special mounting brackets. You just use a standard sunshade-adapter ring. And, right now, there is no wide-field view

ONE OF THE FIRST FilmoRama lens attachments was taken to the Arctic last summer by Popular Science photographer Bill Morris. It was then so new that there were no instructions available on how to use it. At left Bill is shown getting ready to shoot the U.S. Coast Guard icebreaker Easteind as it cracks a path through the thick polar ice pack. The photograph above shows what his wide-picture camera eye saw.

finder for it—you sort of by-guess and by-gosh."

"I gather that the price is lower?" "It's cheaper, yes, The 16-mm, job is \$125 and the 8-mm, one \$75. Anyway, those are the prices that I got from the people who import them—J. L. Galef and Sons in New York, down at 85 Chambers Street."

"That does give me a choice, But say, do these wide-screen home movies really work? Have you seen any of it?"

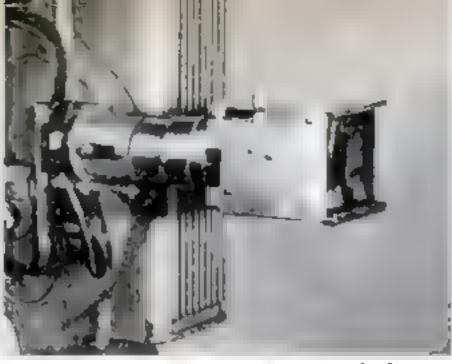
New Systems Give Sense of Depth

"Both systems," I told him. "Not only do you get wide pictures on the screen, but you actually get a sense of three dimensions. Let me give you an instance. When Bill Morris, the chief photographer of Popular Science, and I were up in the Arctic last summer, he took along a FilmoRama lens attachment for his Bell & Howell 16-min, movie camera.

"We were showing the film at the office the other day. When we came to a sequence taken from the bridge of an icebreaker pitching in heavy seas off Greenland, one of the guys asked if there was a Dramamine tablet in the house. He was getting seasick."



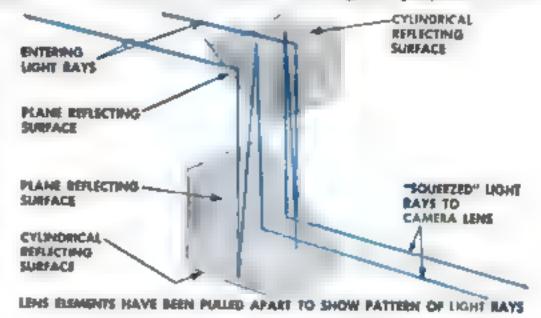
FOR TAKING PICTURES, Vistascope lens is attached in front of the camera lens. It fits a standard adapter ring, used for sunshades.



FOR PROJECTING Vistascope movies, the lens attachment is removed from the camera and mounted in front of the regular projector lens.

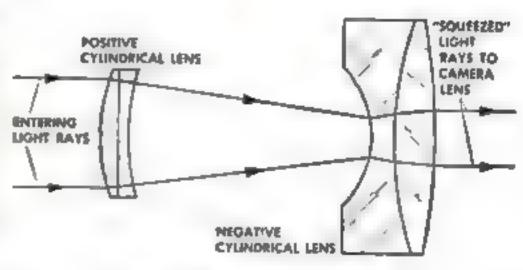
How Vistascope works

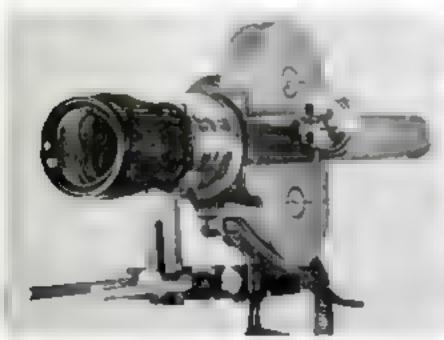
Vistascope uses the curved reflecting surfaces of prisms to put on the squeeze that fits wide-picture scenes on narrow 16-mm. or 8-mm. movie film. Its light-bouncing system is shown in optical diagram at right. When the same lens is put on a projector, the distorted image is unsqueezed and projected as a wide-screen picture.



This is the FilmoRama way

FilmoRama achieves its 16-mm. wide-picture-taking squeeze and wide-screen-projection unsqueeze by refraction, as shown in the optical diagram at right. Instead of being reflected, the light rays are compressed for taking, or magnified for projection, as they pass through cylindrical lens elements of the anamorphic attachment.





MOUNTING BRACKET is required to attach the FilmoRama lens to a 16-mm. movie camera. A special wide-field view finder is also available.

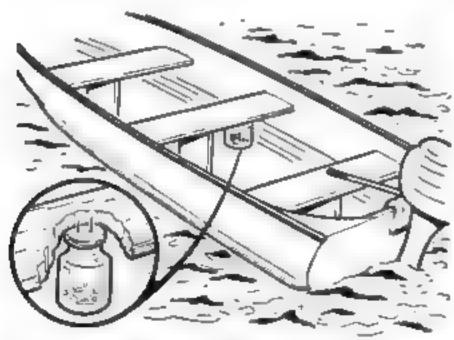


SAME FILMORAMA LENS is attached to the projector to show wide-screen home movies. A special mounting bracket is needed here, too.



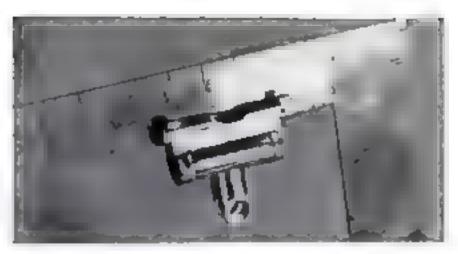
Mirror Cures TV Stiff Neck

With the TV set directly behind me as I worked at my small shop in one corner of our apartment hving room, I found myself suffering from a constant stiff neck. But no more, I mounted a 9"-by-12" mirror above the bench and higher than the bench light, and now watch TV while I work.—Henry Hollwedel Jr., El Paso, Tex.



Dry Spot for an Open Boat

SMALL items such as matches and cigarettes can be kept dry yet within arm's reach in an open boat if you store them in a small screw-top jar attached to the underside of one of the seats. Two small screws through the jar cover will hold the container securely in place.—Roger M. Woodbury, Natick, Mass.



Level Double-Checks Work

CLAMP a small line level on the inner edge of a framing square to tell at a glance if your work is level or vertical as well as square. Be sure the level is parallel with the edge of the square and, if possible, check it with a carpenter's level before relying on it altogether.—Gilbert C. Close, Hawthorne, Calif

Can Turned into Ash Tray

It's easy to convert a conical-top beverage can into a shop ash tray. Place the can under a mechanic's press or between



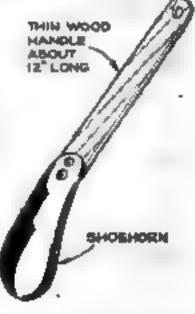
the jaws of a vise, and then apply pressure. The top will pop inward, giving a funnel opening for the ashes as shown in the photo at the left.—J. P. Stechschulte, Columbus Grove, Ohio.

Water Weights Boat in Storm

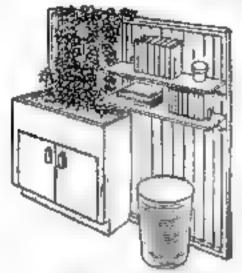
Wanned that a hurricane was approaching. I faced the problem of safeguarding my plywood boat, resting on a trailer in the back yard. Using the garden hose, I quickly ran enough water into the boat to hold it down.—I. L. Saltz, Pikesville, Md.

Shoehorn Arm Aids Old Folks

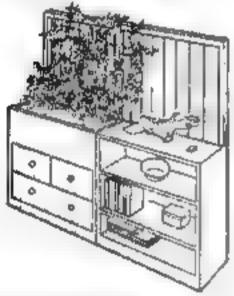
ELDERLY people, or those who find it difficult to stoop, will appreciate this extension shoehorn. Smooth a thin strip of hardwood and attach it to the end of the shoehorn with flathead screws or rivets, countersunk. Finish the hardwood strip with varnish or wax.—Frank Shore, NYC.



How to Turn One Room into Two



easic design can be varied as you wish.



DRAWERS IN CASE require: increased depth.

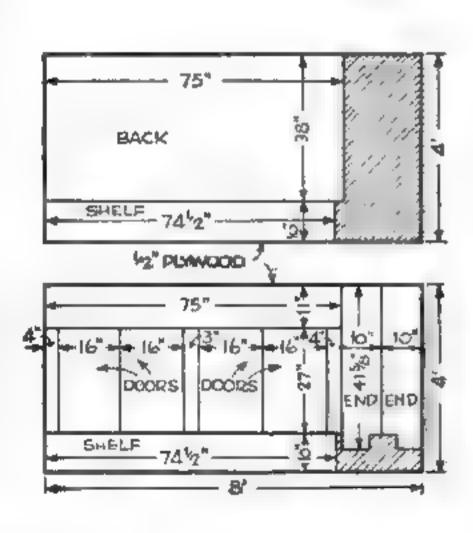
Combination cabinet and plant stand provides needed separation for a dual-purpose room.

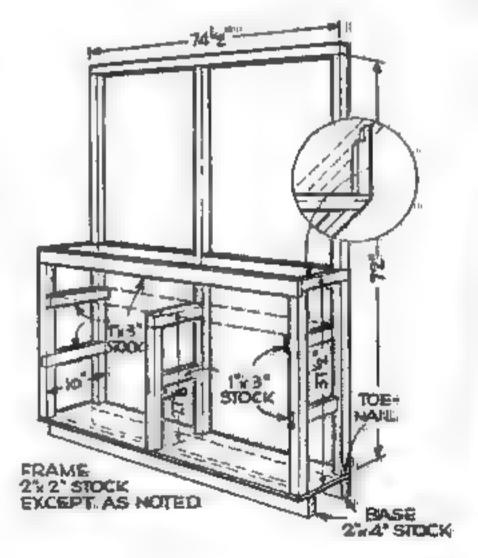
By Carl T. Sigman and William J. Ward Jr.

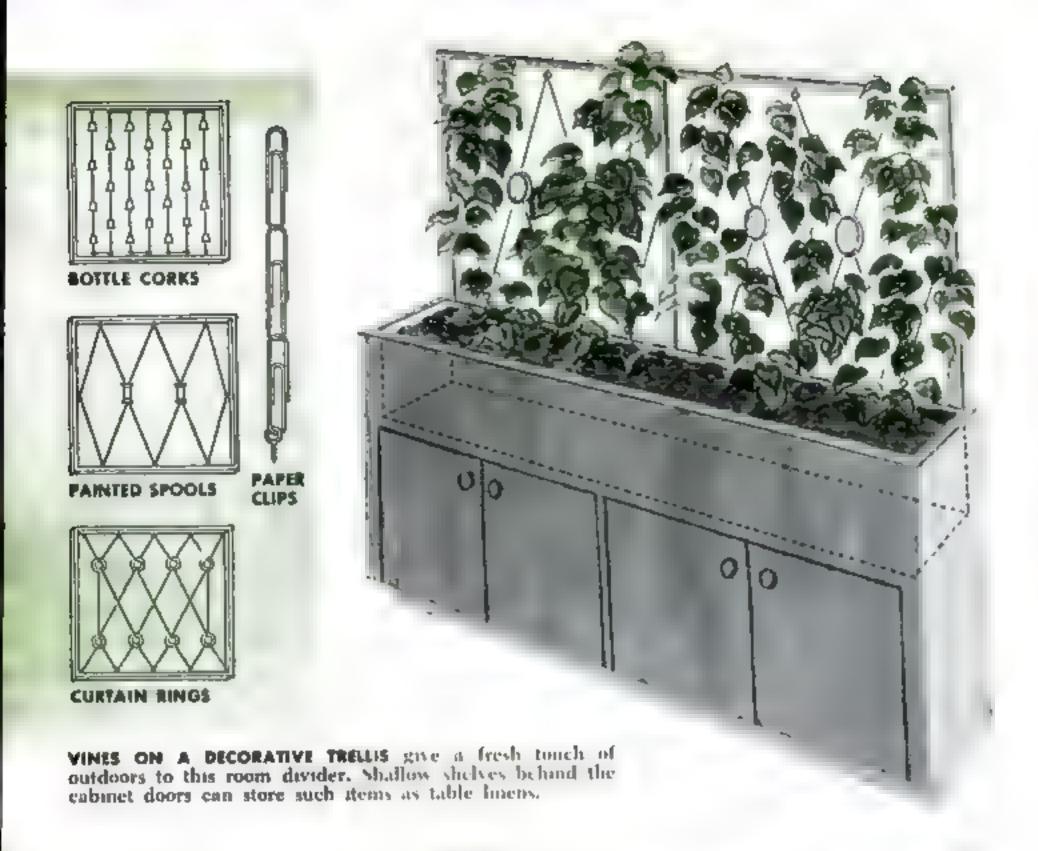
DUAL-FUNCTION spaces in modern homes frequently call for room dividers to separate the dining alcove from the living room or kitchen, a family room from a more formal living room, and the like. These well-lighted, wide-open areas are not disturbed—their attractiveness may even be enhanced—by a well-designed divider that you can build with the simplest tools.

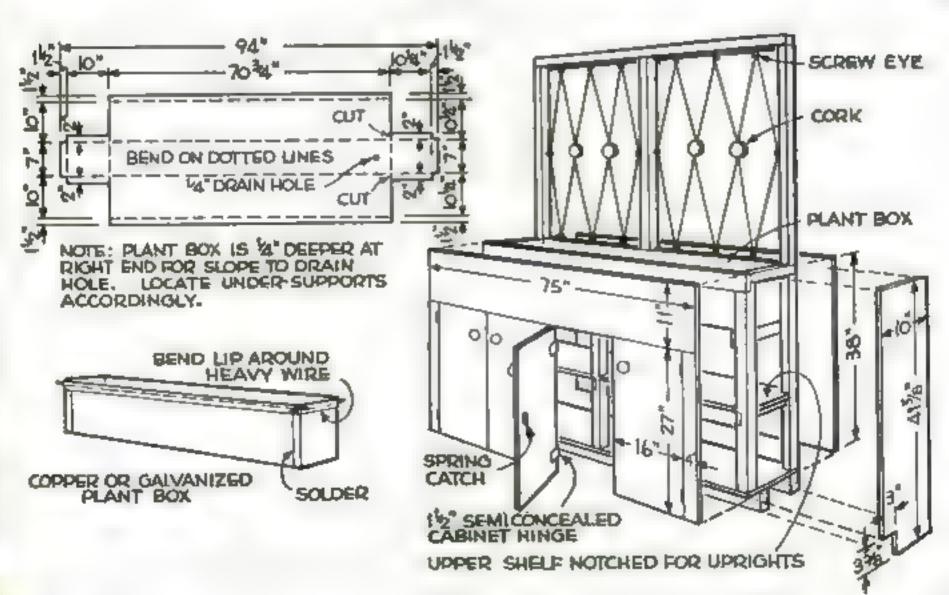
Following a basic design, you can make a room divider to your own taste by combining a shallow storage cabinet and plant stand that contains a rustproof copper or galvanized plant box. The lady of the house can train philodendron or other hardy vines to grow over the trellis which is made of heavy colored cord string through screw eyes. Cork floats, bottle corks or painted spools among other things can be used to decorate such a trellis. You can make up an unusual trellis with paper clips.

Dimensions shown are not critical, but were chosen to allow the front and back and two shelves to be cut from two standard 4'-by-8' plywood boards. If greater length is









required for your room, you can increase that dimension up to 10" and still have sufficient stock to cut out the ends.

The 2"-by-2" frame is heavier than that ordinarily required for similar construction, but it gives an appearance of substantiality to the trellis and may add that extra stability necessary to prevent the household tragedy of an upset. You may even find it desirable to attach the separator to the floor and wall with unobtrusive metal angles.

Any plant box requires drainage, This may be achieved by punching a X" hole near one end of the bottom to take off surplus water, and tilt the box toward that end. Punch from the inside to provide a spout that will keep the water from running along the edges, and place a pitcher or other vessel under the spout at least during watering. Put pieces of broken flowerpot over the hole to pre-



Rubber Ball Spreads Glue

A surr rubber ball filled with glue or mucilage is a handy applicator that contains its own generous supply The sht is self-sealing, and yet it is easily parted to apply a uniform film of adhesive when you give the ball a slight squeeze. A glass ash tray or the bottom half of a paper cup will make a holder.-Ken Murray, Colon, Mich.



vent clogging; then cover the bottom with 1" of coarse drainage material.

You may prefer to purchase a metal box having a false bottom and special provisions for drainage, in which case

change the dimensions to suit.

You will find X" interior A-B plywood for the faces of sufficient thickness to add strength to the toenailed joints supporting the rear uprights on the base. It has one finished side that will take paint. If your room is wallpapered, you may wish to cover the inside of the doors with a matching paper, or a fabric may be glued on. Hardboard would be equally satisfactory, or you can make the faces of redwood, cypress or cedar.

Since your separator very likely will be used with one end against a wall, the facepiece is eliminated at that end. The frame should be cut to fit if it is to go

against a baseboard.

How to Make a Nail Carrier

You can use babyfood jars to make a handy carrier for nails. screws and the like. Using an expansion bit, drill holes 1" deep the diameter of the jars in a piece of 2" stock Press the jars into the!



holes. For handles, bend two pieces of heavy wire to a wide U shape and snap the turned-in ends into a pair of holes drilled into each end of the block

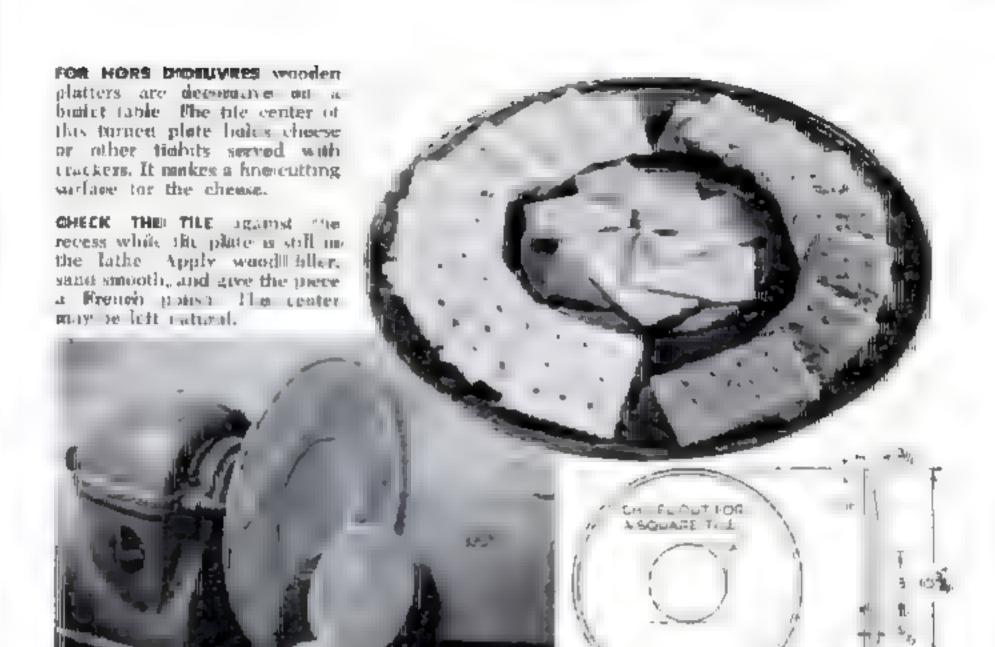
My husband used eight of the small jars for the carrier. When our baby advances to the Junior foods, he plans to make a carrier for slightly larger parts.-Mrs. Roland E. McCune, Harvard, Mass

Candle Seals Glue Bottle

OPENING a glue bottle is lots easier if you use a short piece of candle as a stopper. The glue won't stick to the candle.—Howard E. Moody, Upper Jay, N.Y.

Camera Helps Get Perspective

A REFLEX camera will help you learn to make perspective drawings. Set the camera on a tripod, pointing at the subject. Glance at the ground-glass image when you need help in getting the right perspective.-Chuck Anderson, Burlingame, Calif.



Turned Plate Has Tile Centerpiece for Serving Snacks

Gauen to a waste-wood facentate of sufficient depth to allow free use of the cutting tool on the underside,, that wood-and-life serving plate canabe turned in one mounting in the lather Center the waste carefully on the turning blank. It shouldliff t within the 36 diameter of the bottom. Glue heavy papers between the two piecess to make final segmention easy, and allow the glue to dry thoroughly before screwing to the lathe faceplate

If you are hestaut about the rigality of

the glued-up proces, countersink three screws through the waste wood juto the bottom. Be sure they are long enough to hold! the turning blank firmly but not so longthat the cutting took will strike them when you are turning the recess.

Turns the face first, completing the rim and working to the recess. Them turn the underside. Gumwood (used for the plate. shown) hash, maple and walkut are all rnamental and easy touwork-Elma Waltner Hurley, S. D.

Snap-Lid Jars. Made Re-Usable

BASY-FOOD and other glass pus having snap-on-lids make handy containers for refrig erator leftovers or, in the workshop, for small parts. You can readily identify their contents without using labels.

To make the top easier to remove by hand and yet fit

back on tightly, cut out and discard about one-third of the rubber-gasket fitting in the inside edge of the cap. A little experimentation will give you the right amount of friction needed.-Allen W. Osterling. Dixon, Ill.

Tubing Removes Pilot Lamps:

HARD-TO-CRASP pilot lamps recessed in radios or instrument panels can be easily removed and replaced by using a short piece of rubber tubing. You simply push the tubing over the tiny bulb and twist counterclockwise. Then fit a new bulb in the tubing and reverse the process.

The inside diameter of the tubing should be a snug fit on the bulb so that it will not slip while being twisted.-Mark Peters, Forest Hills, N.Y.

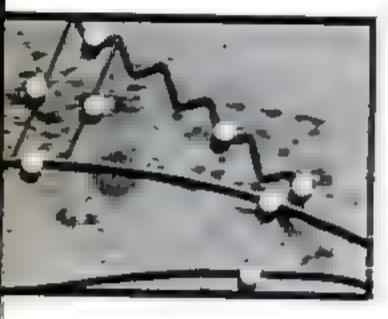


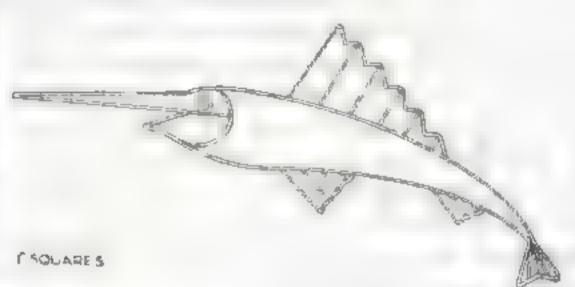


Four Knickknacks for Your Walls

1 You catch these fish with bent coat hangers. Strip the finish off the wire with steel wool or sandpaper. Trace a full-size pattern on a grid of squares. Then shape the wire to match.

As the parts are formed, thumbtack them to a board as shown in photo below. Using acid flux, solder all joints. Solder a small washer in place as the eye. Finish in black.—Clifton Morris, Eubbook, Tex.





2 MATCHING the mode in wire accessories, this frame is made of cont hanger stock. Cut photo, glass and cardboard backing the same size. Tape them together along the edges

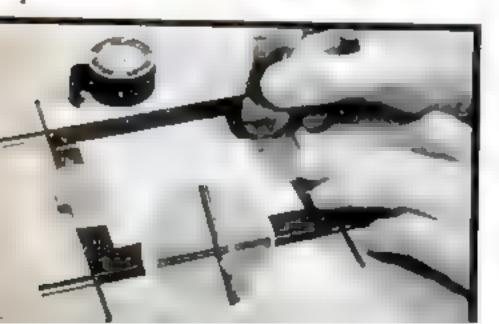
Cut four wires 2" longer than each side. File half-depth notches spaced so that the wires fit around the picture, corners lapped log-cabin fashion. Solder the joints.

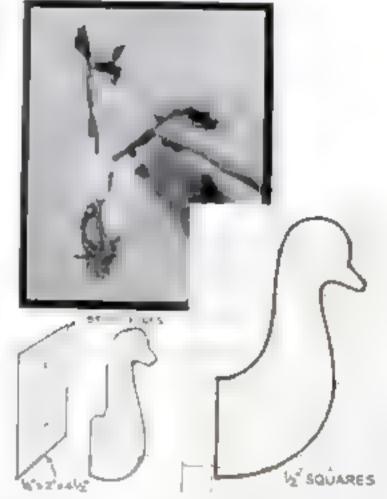
Solder pieces of tin-can-stock to the

top and bottom wires, flush with the outside except for a hanging tab. Paint the wire frame.

Insert the photo from in front. Flip it over to fasten the picture to the tinplate pieces with strong tape placed across these as shown in the photograph below.



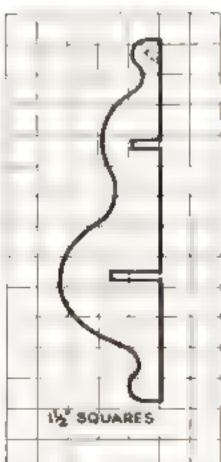




3 It's a snap to keep rubber bands handy without the messiness of having them loose. Cut the head and neck of this holder from K" hardwood. Attach with glue and one wood screw to a back of K" stock having a 5/16" hanger hole. Paint white or yellow, with the bill and eye red or black.—Theodore K. Hastings, Los Angeles.

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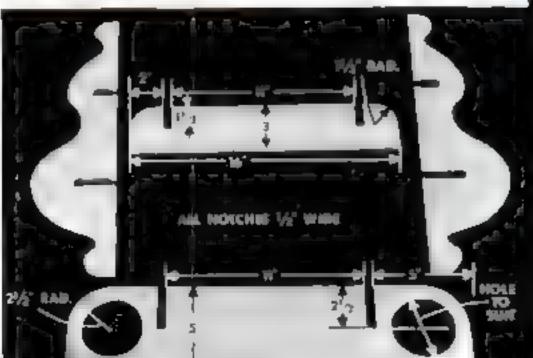
4 Twin ivy pots will add a touch of living greenery to this handsome Early American shelf. It consists simply of four pieces, notched to go together like egg-box partitions.

All stock is 3" thick. Solid wood is preferable to plywood, as the edges will show. If your jigsaw will cut 1" thickness, brad two pieces together and saw out both the sides at once. Make the notches a close fit for the thickness of the material.

Buy the planter pots beforehand so that the shelf holes can be cut to fit accurately. Sand all parts smooth and round the edges. Assemble with glue and brads driven at an angle through the rear shelf edges.

Stain, shellac and wax make a pleasing finish. Attach com-

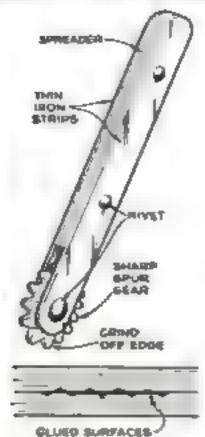
mercial hangers or drill blind %" holes at the top corners as in the drawing. These slip over finishing nails driven at an angle into the wall.—John G. Voelker, Towson, Md.





Indentations with Homemade Tool Strengthen Glued Joint





INDENTING wood surfaces to be glued will give the joints extra strength. This can be done quickly and easily with a spur-gear wheel attached to a simple handle, as shown. When rolled over the surfaces to be joined, the spurs form tiny pockets which pick up the surplus glue when pressure is applied, equalizing the distribution and increasing the glued area. The handle can be made of thin iron strips riveted to a spreader slightly thicker than the spur gear.-]. M. Finn, Pittstown, N. I.

Water in Emergency

When a neighbor's main-to-meter water line sprang a leak at the beginning of a plumberless holiday weekend, we contrived a means of giving him water without the necessity of lugging buckets from house to house. Shutting off the water at the curb and house cutoffs, we connected our two garden hydrants with a length of garden hose and an extra female fitting. Opening both valves provided his household with water.—Wyeth Kidwell, Willoughby, Ohio



You Can Shake Out the Tacks

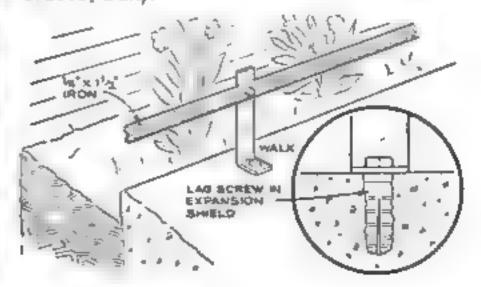
AN EMPTY toothpowder can makes a
good container for
tacks, brads or small
screws. A small funnel can be used for
putting the parts into
the shaker-top opening —E V. Reyner,
Townsend, Mont.

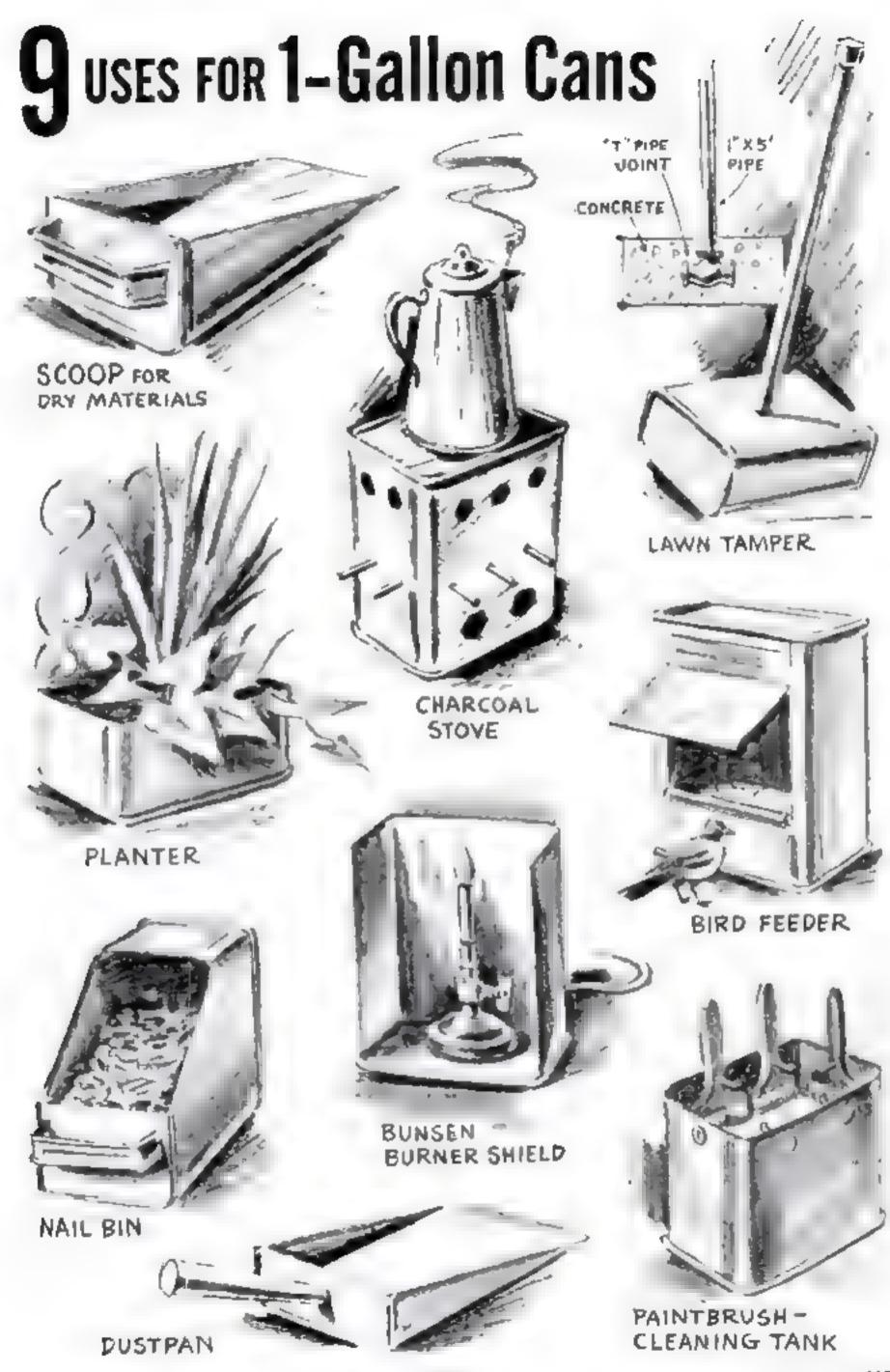
Low Guardrail Along Sidewalk Saves Plants from Damage

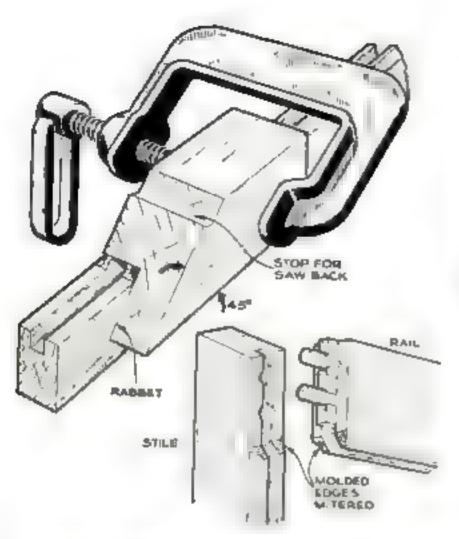


THAT narrow space between a walk and the side of the garage can be perfect for small plants, even when they are subject to the threat of children's bicycles, if you protect them with a simple guardrail.

Bolt a length of X"-by-1X" iron to footlong angles of the same material. Each upright is fastened to the concrete walk with a lag screw in an expansion shield set into a hole drilled with a star drill.—Hi Sibley, Nuevo, Calif.









Guide Block Takes the Guesswork Out of Making Door Joints

Hene's an easy way to join a door upright, or stile, to a crosspiece, or rail, when the stock has molded edges.

Rabbet a section of three-by-four so the resulting L-shaped block can be shipped over the stile as shown in the drawing. Then miter one end of the block at a 45° angle. Lay the front end of your backsaw against the sloping face of the block with the teeth at just the right depth to reach the base of the molding. Mark off the point where the thickened back of the saw will be when the cut is made and cut a slot above it to act as a depth stop. Now

clamp the block in place and saw down through the molding, holding the flat of the blade against the sloping face of the block. Saw along the base of the molding to remove the unwanted molding.

The same block is used to miter the rail. This time, clamp it in place and cut off the projecting triangles of molding by sliding the back of a wide butt chisel along the face of the block.

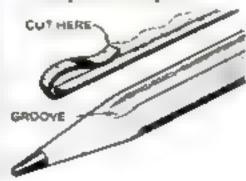
After the molding cuts are made, the stile and rail can be brought to a butt joint and secured with dowels and glue.—Edwin M. Love, Palmdale, Calif

Bobby Pin Keeps Pencil on Line

Taped to a pencil, a bobby pin will keep the point from jumping the cord when you scribe along a chalk line. Cut the wavy leg



of the pin short as shown. Cut a shallow groove in the pencil with a penknife, and bind the straight leg of the pin to your pencil with a piece of cellophane tape

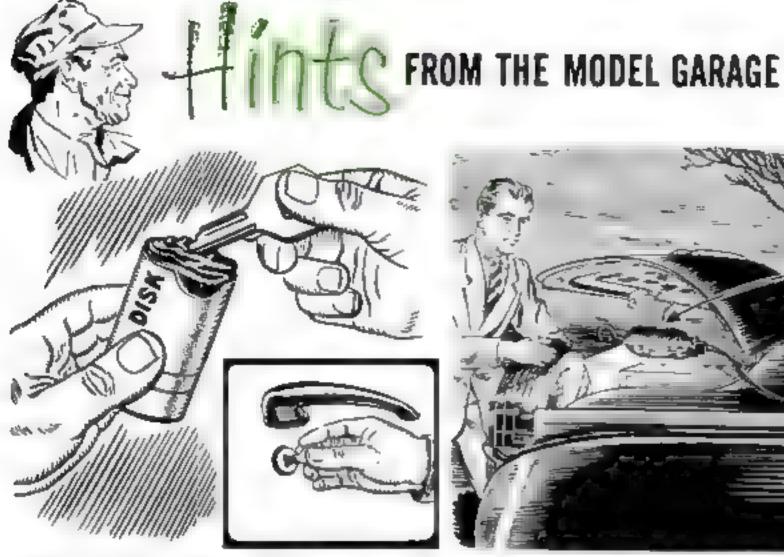


Mixer Is Knitting Aid

WHEN an extra pair of hands is not available, the electric mixer will prove an efficient and quick aid to winding knitting yarn. The an end of the yarn loosely to one of the blade shafts, run the mixer at its lowest speed, and guide the yarn to form a neat ball. Simply remove the beater from the holder and slip the ball of yarn off the shaft when the job is completed.—Hannali L. Miller, Danboro, Pa

Tonic Keeps Nuts from Locking

RESEARCH engineers at General Electric have found that milk of magnesia keeps nut and bolt threads from locking together even after three weeks of heat high enough to melt a brass doorknob. They prescribe it as the best tonic for furnace nuts and bolts.



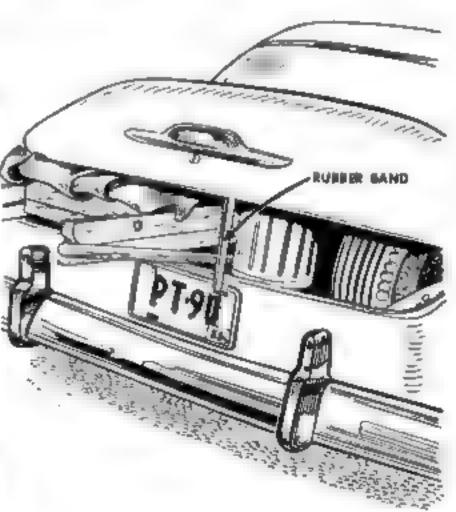
When a key breaks off in a car lock, try this trick. Smear the broken end with adhesive available from hardware stores for mounting sanding disks. Push the smeared end into the lock, then withdraw it. The adhesive may bring the tip out with it.



A trouble light usually has a hook only at the top, making it difficult to hung so that the light shines down. Solder a second hook to the back of the reflector, as above, and you will find that the light will be much more convenient to use.

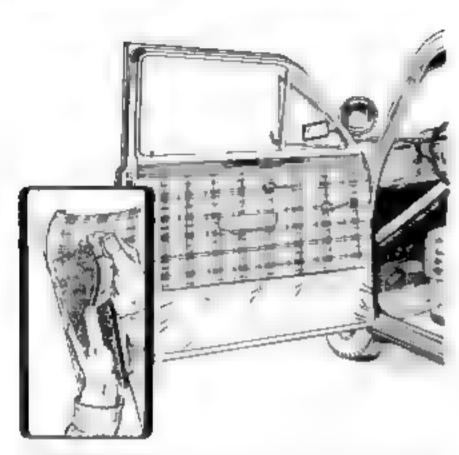


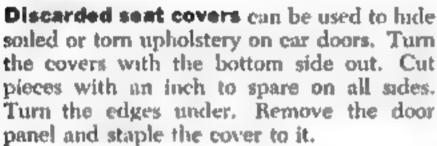
Storing solvent for washing small parts and-tools in a service garage is easy this way. A fabric cover keeps dirt out of the metal tank and you can shove the tank back under the workbench when not in use. The slide is made of %" rod.



If your trunk won't close because you're hauling too much in it, here is one way you can secure the lid. Cut a rubber band from an inner tube, fasten one end under the lid and the other to an eyebolt locked with nuts to the heense plate.

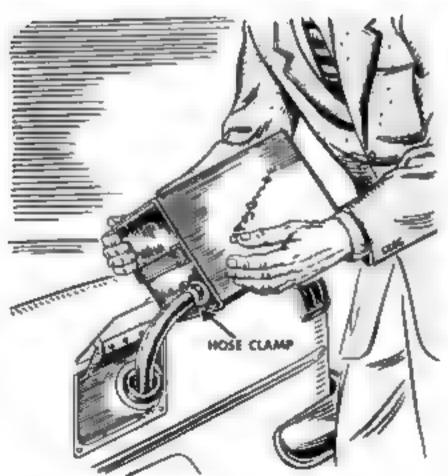
MORE Hints from the Model Garage



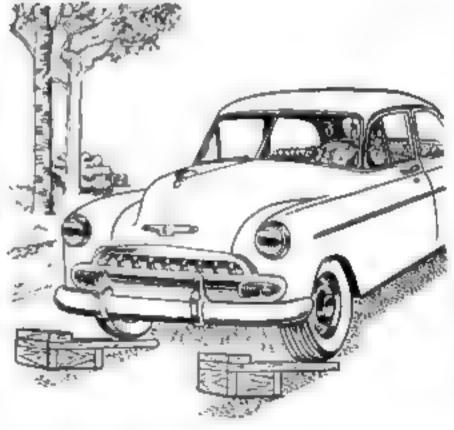




To keep on a driveway hidden by snow, line it with cement markers. Grease the inside of a glass jar, pour in cement and insert the bent end of a 3' piece of heavy wire. Remove the jar when the cement has set. Next fall, raise the markers a foot or so.



Pouring gasoline into the tank inlet of a modern car without splashing the finish is always difficult, even with a funnel. A piece of radiator hose clamped to the screw-top opening of a gasoline can will serve as a flexible pouring spout,



Ramps for undercar work can be made by cutting eight 11%" lengths of two-by-six stock. Nail these on edge to make box forms. Nail each box under the end of a 36" length of two-by-twelve plank. Put the ends under the wheels and drive up on the ramps.

AGHOTTIP

-greatest spark plug achievement in high-compression history!



Ten years ago, AC increased "Scavenging" action as one step in meeting high-compression demands!

Engineers depend on scavenging action, as they term the highvelocity swirling of combustion chamber gases, to carry away the combustion left-overs that cause plug fouling. Years ago, 1944 in fact, AC Spark Plug engineers put this principle to work by increasing clearance between the plug shell and the insulator tip in the AC Type 48 plug. This extra "Scavenge" area alone did not satisfy AC.

An amazing thin-tip, fast-heating insulator added even more — and is still an AC exclusive!

AC developed the insulator material that has completely outmoded porcelain. And AC soon found a way to form this material into long, thin insulator tips that could be recessed around the center wire. These thin tips heat fast, burn away harmful combustion deposits, stay clean longer. No one clse has yet been able to duplicate this design.

Proved by millions of miles of driving in every make of high-compression engine built in America!

Of course everyone expects AC to be in the forefront of research to improve ignition for high-compression engines. The important thing to remember is that these benefits of AC Spark Plug design have been available since the first high-compression engine came off a production line. Today's AC Hot Tip Spark Plugs fit every American make of car'. They are the only plugs designed with double cleaning action. No other spark plugs offer anything like' AC's thin, not tip features.

AC Spark Plug engineers with GM resources can be depended upon to LEAD the ignition parade!



Watch BIG TOWN on NBC TV

another AC feature story that can't be topped!

You can make your own pictures right in the kitchen



No need for a special home darkroom

Modern photo developing and printing equipment is simple, easy-to-use, modest in price.

There's plenty of enjoyment in taking pictures but, if you're looking for a real thrill, try developing and printing them yourself.

It's fascinating to watch the scenes you've taken "come to life" . . . to see familiar sights suddenly reappear as if by magic. Added to this is the pleasure your family and friends will get from those extra prints you make for them.

Of course your photo dealer is always ready to have your film processed for you, but if you want to enjoy this fun and fascination of doing it yourself, don't hesitate any longer.

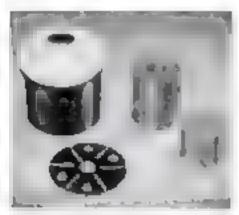
With today's equipment there's a minimum of fuss and bother to home photo-making. Most of the steps can be done in room light and your set-up need not be elaborate.

Above is an arrangement suitable for your kitchen. And, on the opposite page, the equipment shows how simple it all is—step by step.

Your local photo dealer has illustrated booklets to get you started on this rewarding family hobby. See him soon, won't you?

242 POPULAR SCIENCE

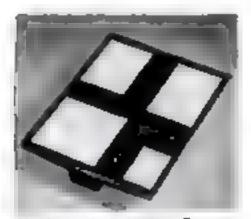
THIS INEXPENSIVE LINEUP LETS YOU START RIGHT NOW



Kodografi Rell-Film Tank with aprona for easy developing of 620-120, 127 films, \$2.53



Kodacraft Rocker Trey Sel includes three 5"x7" trays, with rocker for uniform developing, \$1.95.



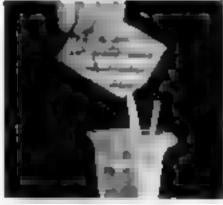
Koducraft Printing Frome with masks for 9 negative sizes. Accepts 414" x 5½" paper, \$1.95

You can develop that roll of film at home tonight . . .

The most convenient developing procedure is to use a small tank, such as Kodacraft Roll Film Tank. Handy Kodak Tri-Chem Pack contains developer, stop bath and fixer chemicals. You just mix with water. Put developer solution in tank. Step into any darkened closet to load the film in the tank. The rest of the operation is carried on in ordinary room light. Agitate film in developer, then in stop bath, and finally in the fixer. Remove film from tank, wash in sink, and dry overnight. Your photo dealer has detailed, easy-to-follow instructions. It's so simple even a child can learn in no time.

... print the pictures tomorrow (Kodak Velite Paper lets you do this in subdued room light.)

Simply place negative in Kodacraft Printing Frame; lay sheet of Velite Paper on negative; close printing frame; expose to ordinary lamp bulb for few seconds. Place exposed paper in tray of developer solution; in about a minute you'll have your picture appearing. Developed print is then placed in stop bath and next the fixer. Wash print and dry on blotter.



Kodak Tri-Chem Pack contains enough chemicals for processing two complete rolls of film, \$ 25,



Keduk Velis Paper makes prints in lighted room, 25 sheets, 211" x 311" and larger. From \$.35.



Kodek Slotter Rell for efficient print drying. Capacity—60 average-size prints, \$2.88.

CONVENIENT PHOTO DEVELOPING AND PRINTING SETS AVAILABLE



Should you desire, your photo dealer can provide you with complete developing and printing equipment in handy kit form.

Kodacraft Advanced Photo-Lab (right) contains Kodacraft Metal Printer, Kodacraft Roll Film Tank, Kodacraft Rocker Trays, Kodak Velite Paper, darkroom lamp, graduate, thermometer, film clips, stirring rod and instructions. \$14.95

Kodocraft Photo-Lab Outfit (left) includes all items of Advanced Photo-Lab except offers Kodacraft Printing Frame (with mask set) instead of Metal Printer and is without lamp and stirring rod. \$9.75



Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N.Y.

Gus Encounters a Stobborn Miss

[Continued from page 182]

"I wouldn't say that exactly," Vancourt put in. "After all, let's not give up so easily. Elmer, we must advance to the rescue of our pal. Now let me see: How can we help him?"

"Help me!" Gus roared, "Why, you slinking coyotes, I'll bet that you two

are at the bottom of this."

"Listen to the ungrateful cuss," Stod-

dard sorrowed.

"The thing to do," Pete Vancourt said, winking at Stan Hicks, "is to figure out the lady's next move. Then we can short-circuit it."

"If you two opens your traps again," Gus growled, advancing with poised sorewdriver, "I'll ram this right down—"

"I've got it," Pete Vancourt exploded, snapping his fingers. "The next time Emma's car breaks down, she'll arrange to have it happen way out on some lonely road, at night."

"How cozy," Stoddard cooed.

"Get out!" Gus bellowed as the pair went down the street grinning.

Gus Noceives a Night Call

When Emma Wilks actually did call Gus from a lonely country road the next evening at dusk, Gus hung up the phone feeling as if he had been poked in the stomach with the handle of a screw-driver. He tossed his kit in the service car and drove out without telling Stan Hicks where he was going.

Gus's lights picked up Emma's car at the bottom of a steep grade five miles out in the country. She greeted him

happily,

"I knew that everything would be all right when I got you on the phone," she said. "I called from the farmhouse over there, and here you are. How nice."

"Yeah," Gus said hollowly, Without hesitation he raised the hood and took off the valve cover. Seeing the keeper half of number four on the cylinder head in the light of his flash nevertheless joited him. This would be the third time he'd put this keeper in. First thing he'd know, the other half would fly out, and

there'd be a valve through a piston. Gus had the uncomfortable feeling that Pete Vancourt' and Elmer Stoddard would leap from the brush at any moment.

Thinking about them as he replaced the keeper, it came to Gus that he might have let their kidding warp his usual calm judgment. With the keeper once more in place, he installed the curved disk of the oil cap on the top of the valve stem, and peered closely at the valve, using his flash. He grunted, brought a feeler gauge from his pocket, attempted to thrust it between the rim of the oil cap and the top of the spring.

Oil Cap Gets e Pounding

"Miss Wilks," he said disgustedly, "you" have been bringing your car to a fool."

"Why, Mre Wilson!"

Gus didn't hear her. He was busy taking off the oil cap, placing it on the flat of a fender dolly, pounding its rim with a hammer, replacing it, adjusting valve rocker-arm clearance and sending Emma on her way.

Back at the Model Garage a shamefaced Gus told Stan Hicks the sad story.

"When they ground the valves," he exclaimed, "they naturally trued up the ends of the stems on a grinder, But they ground number-four intake a little short, so that the oil cap, instead of resting on the top of the valve stem, rested its rim on top of the spring.

"So when the rocker arm came down to open the valve, the curved-down rim of the oil cap brought pressure to bear on the spring before pressure was brought to bear on the valve stem. This released pressure on the keepers, allowing one half to pop out. With the spring cocked over, the other half fortunately stayed in. All I had to do was to flatten the rim of the oil cap, so it would rest again on the valve-stem top and clear the spring."

Stan Hicks grinned disbelievingly. As he moved off to close up for the night, he hummed the Wedding March.

NEXT MONTH: Gus pulls a switch.

How Researchers Solved

Detroit's Biggest Problem

... their ingenuity may make your present engine last years longer and save you hundreds of dollars in repairs.

THEORETICALLY, YOU'R ENGINE should never wear out, because the moving parts never touch each other. They're always separated by a thin film of oil. The problem is to keep abrasive particles out of that thin film of oil. That problem has become tougher every year since the Model T, as engine clearances have become finer and speeds higher.

Today, abrasive particles comparable to the thickness of the ink on this page may do hundreds of dollars of

damage to your engine!

Because hot oil, under pressure, often forces "channels" in rag or paper filter packs, these abrasives get through. That's why a team of researchers developed a new material for oil filters: porous bronze.

This new filter material is made of millions of microscopic balls fused together. No amount of oil can force a channel in it. No dangerous abrasive particles can get through, it doesn't soak up valuable

oil additives as absorbent filters do. And you never change (t) You simply rinse it in gasoline and keep on using it for 10,000, 100,000 and more miles of driving. It's called the Life-Time filter.

The cost? About the same as a couple of throwsway filter packs. In addition to saving the cost of filter pack replacement, you save the quart of oil soaked up and thrown away with ordinary filter packs and — most important — you save money on engine repairs by filtering out dangerous abrasives.

APPURTURITY FUR CEALERS AND DISTRIBUTION

A dealer and distributor network is now being formed to handle demand generated by advertising and editorial features in national magazines. If you can qualify, you can be first with the most exciting automotive product of this decade, to win new customers and build a substantial business. These valued franchises are not being sold; they are awarded on the basis of ability to grow with us. For complete details, write or wire. Continental Manufacturing Corporation, Dept. FPS-8. Washington Blvd. & Motor Avenue, Culver City, Calif.

Evolution of Bronze Filter Design

1. "Tin Can"

2. Rigid Cone





- 1. First crude attempts to design a bronze filter simply imitated the shape of the ordinary throwsway pack. Because of its basic structural weakness and the danger that sediment packing between the element and the case might critically reduce oil pressure, all attempts to "improve" this design were abandoned, even though it was relatively cheap to manufacture.
- 2. After considering almost every geometric shape, the cone was selected as the most rigid and was used for the Life-Time filter. This design also allows the sediment to drop to the bottom of the case, clear of the element. It has withstood the ultra-some vibration test and the 100G shock test. Only the Life-Time filter uses this exclusive cone design, it is fully protected by patents.

THE TOUR COM

Try the Lifetime filter on your car for 2 weeks: if it isn't all I say, you get your money back; if you keep it, you're through buying filter packs—the Lifetime filter is guaranteed for 10 years, actually will last many times that long.

For complete unit, including case (install on any car in 10 minutes), send make, year and model of your car and \$12.95 (we pay

shipping).

Conversion kit, which replaces your present filter pack with Life-Time bronze, is \$6.95 for most cars (send make and number of present filter when ordering). Conversion kits for Buicks with hydraulic lifters and for cars with full flow systems: \$13.95.

Or send only \$2 deposit, pay C.O.D. charges on arrival. But do it today—don't waste another cent on filter pack replacemental



Complete Lifetime



Lifetime Conversion Kit; replaces ordinary packs with permanent broase element.

CONTIN	t Filter Division, Dept. FPS-2 ENTAL MANUFACTURING CORP on Blvd. at Motor Ave., Culver City, Co	ılıf.
Ship De	emplete unit for	
	make, model, year	of car
De.	nversion kit for	
	make and number of presen	t filter
I enclose	 \$12.95 for complete unit (\$18.95—cl \$6.95 for conversion kit (full-flow, \$) \$2.00 deposit; send C.O.D. 	rome)
Mame		
Address		
City	Zone State	

The HGS behind Ford's new Trigger-Torque Power

The world's greatest builder of V-8's brings you all the advantages of high-torque "Go" in 3 new and mighty engines for 1955!

Lytto diseased to do all the things you want the ability to deliver just the right amount of "pushif at the reasonable when you need it. That "pushif of course, is the direct result of engine forque. And Ford's new engines are capable of delivering, much higher torque throughout the full range of driving speeds. The result is new Trigger-Torque power with trigger-quick response available to your many traffic situation. On the highway, too, you'll pass with the confidence that you've got power to spare.

Ford's many new engine advances make this Trigger-Torque power possible. For example, all '55 Fordlongines have higher compression ratios which mean greater efficiency. There are new free-flow induction systems for full breathing and even distribution of fuel. There are branchnew, deposit-resistant turbo-action spark plugs and improved turbo-wedge combustions of the fuel-air charges.

In addition; there's Ford's traditionally gidle deep-block constructions for longer life and smoother operation. There's Ford's famous-low-friction design for less wear and most economicalluse of gas. And every Ford engine features the exclusive power-boosting; fuel-saving Automatic Power Pilot.

NEW 162-h.p. Y-BLOOK V-8:

If your haven't driven Ford's news more powerful Yablock Vas yet, you're in for some thrilling surpressa For this engines with its greater displacement (the highest in Forditaliseld) and higher compression, is another engineering trumph from the world's leading builden of V-8's. In all Farlane and Station Wagon models, this new engine has a dual exhaust system that reduces back pressure.

NEW 182-N.p. Y-BLOOK SPECIAL VAS

If you want even greater Trigger-Torque penformance you can have Ford's Y-block Special V-8. It's available on all Bordomatic-equipped Fairlane and Station Wagon models: The compression ratio is 8.5 to 1. And the 4-barrel carburetomarily opens up when you need GO: An "extra" pair of basels boosts the flow of fuel-air mixture as needed to meet acceleration demands:... cuts-optilantimatically when a steady speed is resumed.

NEW I-BEOCK.SIX

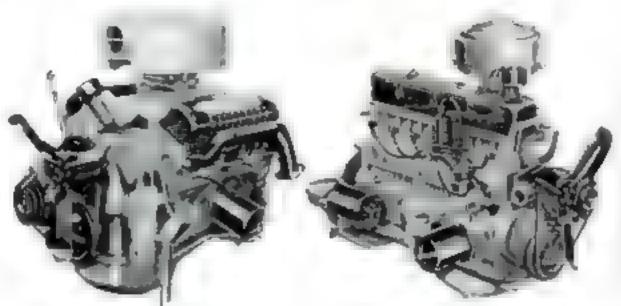
If you prefer sizes, Förd's new I-block Six is America's most modern. It's the only short-stroke, low-frictions in the industry, today. And with its higher compression and its improved carburction system you get higher torque at all driving speeds.

WHY NOT MAKE YOUR OWN TEST DRIVE, THIS WEEK

3 MIGHTY ENGINES FOR 1955



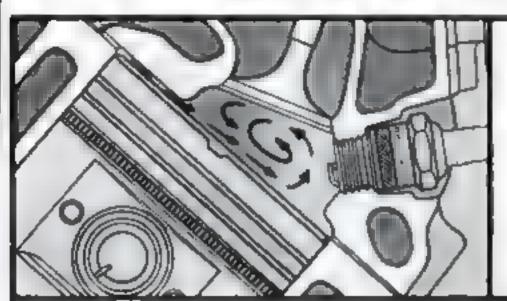
272 en in, displacement, 7.6 to 1 compression ratio.



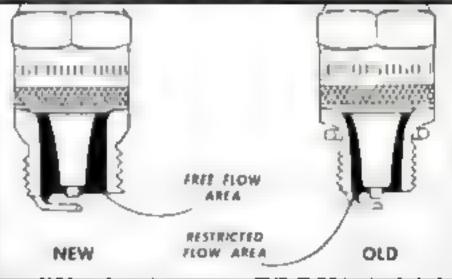
182-h.p. Y-block Special V-8 272 cu in displacement, 8.5 to 1 compression ratio.

120-h.p. 1-block 5ix 223 cu. in. displacement, 7.5 to 1 compression ratio.

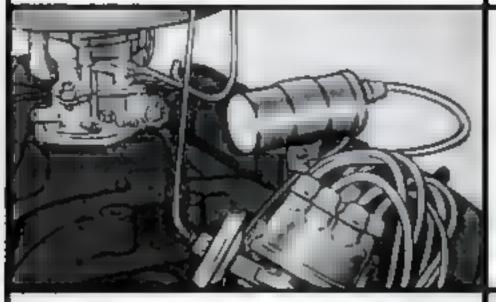
All 3 new Ford engines have these important advances



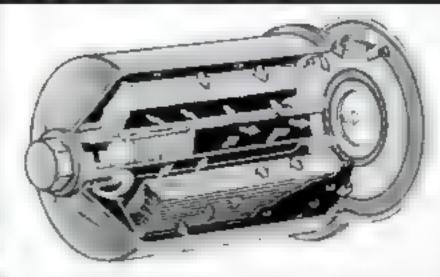
Turbo-Wedge Combustion Chumbers are wedge-shaped to swirl fuel and air into a uniform mixture for efficient combustion.



New Turbo-Action Spork Plugs to Ford "first") resist formation of deposits up to three times as long as conventional plugs



Automatic Power Pilot makes sure just the right fuel air mixture is sanited at just the right instant to give you more "GO"!



Fuft-Flow Oil Filter, as ulable on all Ford engines, cleans all the oil all the time... protects bearing surfaces from barinful abrasives

Big Business Grown from Strawberry Patch

[Continued from page 151]

Cleveland, and became Co. of powdered-metal specialist, working on parts for aircraft disk brakes, superchargers and other war projects.

By 1947 the job was over, and he said to Floyd Kuhen, an old friend from his Nela Park days, "Floyd, I'm going to do it now." There was no question about what he meant. He had dusted off the power hoe.

"Howard had wonderful support from his wife," Kuhen relates, "Maybe she didn't have his faith in the machine, but

she had plenty in him."

A Little Cash and a Lat of Confidence

Few others offered him any solid encouragement. Ober's father still thought he should become a dairy farmer. But. with the help of Kuhen and some local implement dealers, Ober put his hoe on the market, Capital was scarce, but his distributors showed their faith in him by advancing eash so that he could buy raw materials.

Kuhen quit his job to devote his full time to selling Ober's hoes. During the fall and winter, when nobody would consider buying garden tools, Kuhen worked alongside Ober in the shop, welding, drilling and assembling machines for what they hoped would be a spring rush of business.

"You couldn't tell which of us was the Kuhen relates, "except that Howard often worked long after I went home."

Sales in 1948 rose to \$22,900. Ober sold no stock, obtained no financing. He plowed the receipts back into the firm as fast as they came in. That winter Kuhen went to Florida to sell hoes there during the slack season in Ohio. He not only called on dealers, but stopped his car whenever he saw a man working in a garden, hauled out a Roto-Hoe, and demonstrated it on the spot

Not content with making a tiller-cultivator, Ober meanwhile designed a number of attachments that would convert the basic machine into a sprayer, lawn mower, edger and rotary snowplow. Suburbanites became increasingly aware of this aid to aching muscles. The plant was enlarged, a streamlined office organization set up.

The Roto-Hoe and Sprayer Co. now employs about 50 shopworkers in peak periods, and has an office and administrative staff of 25. It's at least 50 times as big a business as it was when Ober started it only seven years ago.

Machines Handla the Correspondence

That Ober still loves gadgets is suggested by the number of machines used in his office. Accounts are calculated and invoices made out by automatic machines. Routine letters type themselves after an employee has written the name, address and date—a perforated tape like that in a player plano triggers the typewriter keys to rattle off the rest, All office stationery, ink and typewriter ribbons are bright green, like the Roto-Hoes themselves.

The company's newest model, the Hummin' Bird, is entirely Ober's own design. It has the same 2-hp, engine as his standard model, but the tines revolve in a horizontal plane at the back instead of in roller fashion at the front, letting the machine work in closer quarters.

Mrs. Ober doesn't consider her husband much of a home handy man. Though he cuts the grass, using a Roto-Hoe with the mowing attachment, he hasn't found time for a garden of his own.

"Think I'd better start one, though," he says. "We've been running an ad that says gardening is great relaxation. That sounds like just what I want. END

Progressive Thinking

A first-grade class at the museum was deeply interested in the mummies,

"What does that label—B.C 789—mean?" lit-

tle Sue asked her small boy friend.

"Oh, that's the license number of the car that hit him," he replied with masculine assurance.-Public Safety.

Texaco Tipe On Car Care

How to keep from getting stuck in ice and snow-

To avoid getting stuck in ice and snow, keep a container filled with a mixture of sand and ordinary rock salt in your car trunk. Then, if your rear wheels begin to spin, sprinkle a handful of the mixture directly in front of each rear wheel. It is also good to let a little oir out of the rear tires for more traction. Shift into second gear (or "Drive" with automatic transmissions) and give it only a moderate amount of gas—do not race the engine. Doing this, you should move out of any impeding snow or ice. For best mileage — both tires and gasoline—don't forget to reinflote your tires promptly.



HAVOLINE

How to get the best all-'round performance from your engine

Rugged road tests—millions of miles of both low-temperature mountainous driving and hat desert high-speed runs in more than a hundred new core—ware conducted recently by an independent research argonization. The purpose was to find the best motor oil for today's high-compression engines. Results: Test engines using Havoline (1) had greater gasoline and all economy, (2) showed no appreciable wear, (3) and were much cleaner. Havoline will give you all-'round performance that no other motor oil can deliver... regardless of price. For more engine power, greater gasoline mileage and new-car liveliness that lasts, get Havoline today.

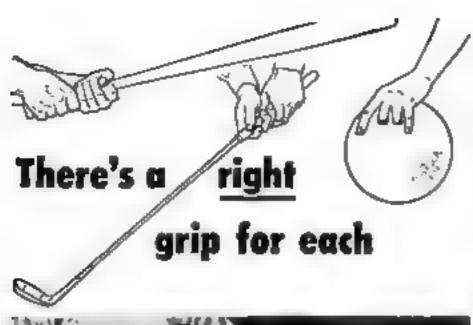
See your Texaco Dealer . . . the best friend your car has ever had.

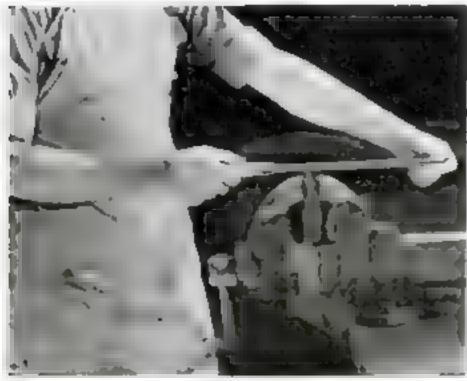
TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

THE TEXAS COMPANY

TEXACO





IN PACT, there's usually a right grip for each attuation you face and each result you want to achieve. In filing both the right type of file and the right grip, stroke or touch are necessary—(a) for the kind of metal you are filing; (b) for the roughing, finishing, smoothing or sharpening the job calls for.

Nicholson's famous 52-page book, "File Filosophy" (in a new edition just off the press), is rich in information on the subject.



It also illustrates and describes a comprehensive assortment of Regular, Special Purpose, Curved Tooth, Swiss Pattern and Rotary files every skilled homecrafter or professional mechanic will be proud to own. The book is FREE—send for it.

Nicholson and Black Diamond file brands have no supe-

rior anywhere in the world. Good hardware stores pride themselves in selling them.



NICHOLSON FILE COMPANY
19 Acord St., Providence 1, E. L.
In Conada: Nichotson File Company

of Canada Ltd., Port Hope, Outario)



NICHOLSON FILES FOR EVERY PURPOSE

How to Win Fame and \$1,000 [Continued from page 141]

The original device had another serious weakness. Because magnetization had taken place at only one point on the wire's circumference and because the wire tended to rotate as it was played back, the sound would fade out and then come in again. Camras took care of this by extending the magnetic field all around the wire.

To fight the depression, Marvin's father had dropped bookbinding and gone into the grocery business. In a room over his store the boys put their apparatus together. It was a bulky thing, spread over several tables. But one evening, after working nights and weekends for a month, Camras turned a switch, watched the piano wire roll off one spool onto the other, and whistled a few notes of Yankee Doodle. Then he rewound the spools and started them forward again. Yankee Doodle came whistling back at

Recorder Wins Him a Job

him.

When the Institute opened for the fall term, Camras carted his device to the electrical-engineering lab. The professors suggested that he demonstrate it to the Armour Research Foundation. He did so and was promptly invited to go to work for Armour as soon as he finished school. This he did in June, 1940, completing the four-year electrical engineering course in 3% years and graduating at the top of his class.

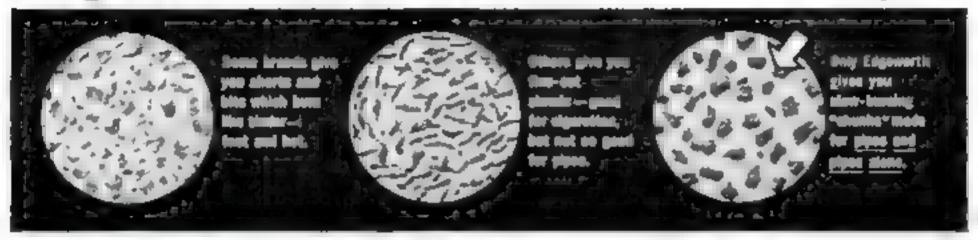
Armour Research Foundation, which specializes in work for industry but has a number of important Government contracts, now employs more than 1,100 scientists and engineers. Half a dozen of these work with Camras, who is rated as a senior physicist. In the summer of 1940, however, the staff numbered about 25; the electrical engineering department had two men, counting the new graduate; and Camras could spend only part time on his device. To keep improving it he worked nights, often until four a.m.

Early in World War II, some Naval

[Continued on page 252]

ALL ABOUT TOBACCO... INCLUDING SEVERAL REASONS WHY

Edgeworth Never Bites Your Tongue





Edgeworth's Way with White Burley Has Never Been Equalled

Tobacco experts know white burleys are the world's coolest smoking tobaccos. Edgeworth is a blend of aged burleys only. Other tobaccos use white burley too—but nobody yet has found how to process tobacco to give it the even-burning, cool-smoking character of Edgeworth "Ready-Rubbed".

What "Ready-Rubbed" Means to Your Smoking Pleasure

Old-Timers knew the secret of cool, even burning. They "hand-rubbed" their tobacco until it crumbled into chunks of just the right size. Now before Edgeworth is packed, an exclusive process "ready-rubs" it to give you a cool smoke with never a touch of tongue bite.

YOU'RE SMARTER SMOKING

Edgeworth

AMERICA'S FINEST PIPE TOBACCO FOR OVER HALF A CENTURY

This Amazing Pouch Means Cooler Smoking!



Edgeworth leaves our plant with just the right moisture content for a cool, no-bite smoke. Every pouch is that way when you open it, for only Edgeworth has the Seal-Pak pouch, Airand-water tight, it promises you fresher tobacco than any other pocket pack.

Forgitten in Tackle Box— Edgeworth Mill Free

A fisherman left an unopened Edgeworth pouch in his tackle box for a year. When found, the tobacco was still moist and cool smoking.



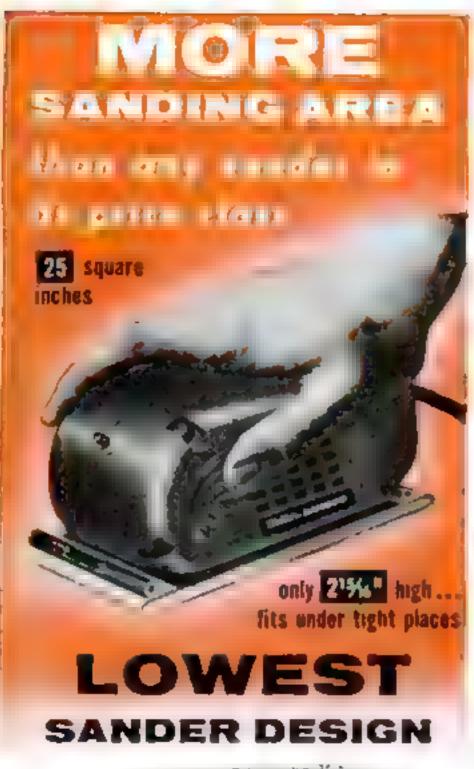
FOR A COOL MIXTURE TRY HOLIDAY

A blend of five tobaccos selected for mildness and aroms — in the Seal-Pak pouch.



Get this new polished aluminum stem "Park Lane" pipe with interchangeable imported briar bowl and exclusive "dri-doma" mountare trap along with 2 full-mixed pouches of EDGEWORTH tobacco If your dealer can-

Plane	mppty —	you,	umo th	and Jan	ody (order	Dipi	k.
KAK								_
City					St	ete_		_
Mail	erth	\$1.50 mpant	o do .	Park Ric	Land	d. Va	urust retati	d
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The Newest Power Sander and Polisher on the Market

As efficient as any rotating motor-driven sander, plus these quality features: straight-line action, no bucking, sands with the grain and goes all the way into corners; powerful 60 cycle reciprocating motor gives 14,400 strokes per minute; exclusive insulation gives smooth, quiet operation; push-button control; 8 foot cord.



*AYAMARIS-AT-HARDWARE-STORES

How to Win Fame and \$1,000 [Continued from page 250]

officers saw the recorder and quickly passed the word to the Pentagon. Before long a hand-built model had been installed in a submarine to pick up what happened during maneuvers. Officers then analyzed the record and suggested ways of improving undersea operations.

By the end of the war, more than 10.-000 recorders had been delivered to the services by 48 manufacturers licensed to use Camras patents. Now more than 60 companies hold Armour licenses.

Though an exceedingly modest man, young Mr. Camras is not surprised by the immediate success of his work or by the constantly growing uses to which his inventions have been put. He thinks magnetic recording is wonderful. His only surprise is that someone else didn't develop it long ago.

Since the war, Mr. Camras has concentrated on tape, rather than wire, as a recording medium because of the ease with which it can be spliced and edited.

Most of the tape sold so far has been blank. The buyer has used it to make his own programs—recording his family, or the radio, or a party. But there is an increasing market for recorded tape because it has excellent fidelity, is easy to store, and can be played thousands of times.

Spike Jones for a Quarter?

The inventor suggests that music stores might offer a make-your-own recording service. The customer would load a spool of blank tape into a vending machine, drop a quarter in the slot, and come away with a Brahms or a Spike Jones.

Also on the Camras work program is a method for recording both the pictures and the sound of a TV program—so you could spend Saturday afternoon fishing and still catch the baseball game when you got back.

Since he collects a share of the royalties paid by patent licensees, the father of modern tape recording describes him-

[Continued on page 254]



"The <u>Performance</u> of Chevrolet's Three New Engines Is Only Half the Story"

-Ed Cole, Chevrolet Chief Engineer

Your shoulders and your ears will tell you about the performance of the new Chevrolet "Turbo-Fire V8"... for you'll feel the sky-rocket acceleration as 162 h.p. shoves you back into the seat... and you'll strain to hear the hush of eight balanced power impulses.

But I wish it were as easy to explain the even more important design features that give this ultra-compact power plant its long life and economical running—how, for example, we planned for low heat-rejection, so the cooling system could be smaller; how we cut the stroke to three inches to pare down power-wasting friction (and how this let us use a four-quart oil capacity instead of five); how the shorter, lighter connecting tods put less strain on the bearings; and how the high-turbulence cylinder head permitted the super-efficient 8 to 1 compression ratio.

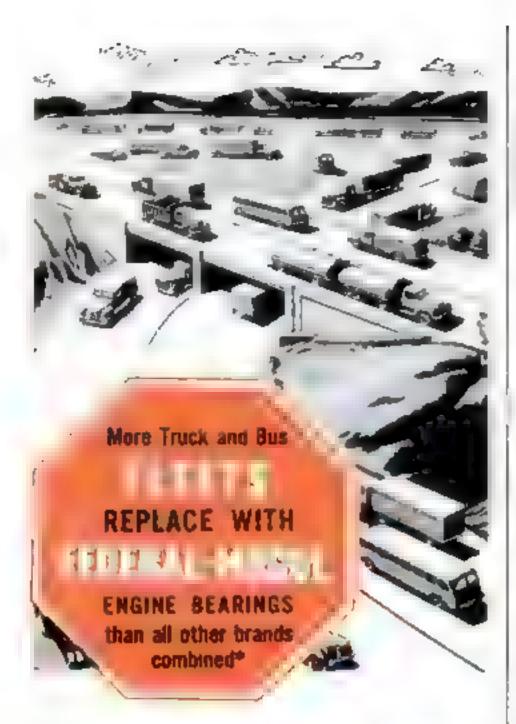
I'd like to take you "inside" the two new "Blue-Flame" 6's to show you the high-capacity water pumps, the one-third reduction in fan speed (which means much quieter running), the floating intakes that pick up cleaner oil, the four-point engine suspensions that smother power vibrations, the 12-volt electrical systems that give faster winter starting and better firing at high speed—all the things that make these overhead-valve sixes the world's yardstick for engine dependability.

But I can't even list all the major engineering advances on this page. All I can say is: Once you've driven a 1955 Chevrolet you'll know why we're so proud of these three new engines. . . . Chevrolet Division of General Motors, Detroit 2, Michigan,

motoramic



More than a new car...a new CONCEPT of low-cost motoring!



To restore Full, Clean Power in Your Car do as the Fleets do . . . replace with Federal-Mogul Bearings

The men who run America's great truck and bus fleets know how to recondition engines for best results. For example, a recent independent industry questionnaire, invoiving 83,360 trucks and buses, disclosed this fact: 66.7% of the vehicles surveyed get Federal-Mogul engine bearings as first choice for replacement. Do as the experts do! In reconditioning your car engine, install Federal-Mogul Oil-Control bearings. They restore full, clean power, pick-up and economy! They cost no more, yet have led the replacement field for 30 years ... because of quality! Federal-Mogul Service, Division Federal-Mogul Corporation, Detroit 13, Michigan.

for New Power . . .

FEDERAL-MOGUL

Oil Control Bearings

BEARING
MANUFACTURERS
TO THE
AUTOMOTIVE
INDUSTRY
SINCE 1899



How to Win Fame and \$1,000 [Gostmand from page 252]

self as well-off—for a physicist. Had he gone into business for himself, he might have made a fortune, but he prefers to work in what he calls a campus atmosphere, without thought of what his work may get him. When someone recently described his car as old, Camras remarked in surprise that he'd been driving it scarcely six years.

He'll Burn Midnight Oil in Sun-House

The Camrases have been living in a three-room apartment but are building a ranch-type house in Glencoe, Ill., 25 miles from Chicago. If pressed, Marvin Camras will tell you that it's a solar house-meaning he has designed it so that the sun's rays can get in during the winter and help heat it. But his principal interest is in its basement. It will run the length of the house and be filled with lathes, saws, vacuum pumps—"no end of stuff."

"If you have some equipment at home," he explains, "you can work until four in the morning without having to worry about transportation."

Camras sometimes is asked how you go about being an inventor. He then paraphrases the advice of a famous composer. "If you have to ask how to become an inventor," he says, "you will never become one."

That sounds a little harsh, so he adds, "You have to take an interest in something, and you also have to have a lot of luck."

That is his account of how he has won fame and \$1,000 from the earnings of \$4,000 that a Scotchman gave to the City of Philadelphia in 1816.

Point of View

Two motorists met on a bridge too narrow for two cars to pass.

"I never back up for an idiot," shouted one

driver.

"That's all right," replied the other quietly, as he shifted into reverse, "I always do."—Youngstown Kutchens Merchandiser.

HARE IS MULTIPLE. AN EXELSE FOR HUSY CURRENT HURSE

Here are America's deluxe outboard motors the quietest running, easiest driving. smoothest riding Sea-Horses ever developed The new Sea-Horse 10, the new Sea-Horse 25 and the new Electric Starting 25 are floated from their stern brackets like the Sea-Horse 514, which created a sensation with its smoothness and its quiet. That's Suspension Drive! It isolates your boat from engine vibration as no other method of mounting can. Engine throb is absorbed noise is dissipated and you experience the thrill of big motor speed with amazing new quiet and comfort . . . See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book.

REE! New Sea-Horse Catalog. Describes the 5 great Sea-Horses for 1955, including the famous 3 hp. 32 lb. twin Sea-Horse 3. Write for your copy

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FOR DEPENDABILITY



and accessories of your choice.

2nd PR ZE

\$750 worth of Delta Power Tools and accessories of your choice.

3rd PR ZE

\$500 worth of Delta Power Tools and accessories of your choice.

AH PRIZE

\$250 worth of Delta Power Tools and accessories of your choice.

PLUS Tenhanorable mention certificates, each worth \$10 in Delta Power Tools or accessories.

Win the Delta Tools You've Always

Wunted . . . If you're now a Delta owner, no one needs to tell you about Delta quality. It's there in the rugged feel of your Delta machines, in the smooth way they operate, in the a most complete freedom from maintenance problems. and in the tine precision work they help you turn out more easily. And now you have a chance to get more Delta tools the interest of the control of the c the linest circular saw made for industry and the home? A Band Saw? Scroll Saw? Grinder? Have you seen Delta's new 6" Jointer, with extra long bed? Or the brand new Delta. 14" Drill Press with eleven exciting new features?

Whatever it is you want most now's your chance to get it and more So get your entry form for the big Delta Users' "FINEST HOME WORKSHOP" Contest, and get going now!

DEITA OHALITY HAKES THE DIFFFRFAL

Fine DELTA Power Tools

n Delta Users' "Finest Home Workshop" Contest!

A Contest to Discover the Best Home Workshop
Use of the Finest Tools Made Today

Nothing to Buy

you now own three or more Delta Power lools, you are eligible to win up to \$1000 berely by sending us a picture of your shop, and telling, in your own words, why you like belta tools. There's nothing to buy, no red ape. And the big prizes are all in the form good-as-cash certificates which you can reseem at your Delta Dealer for Delta tools I your choice!

asy to Enter

ere's all you do to compete for the big first rize (\$1000 worth of Delta tools) and fouren other valuable power tool prizes:

- Get an official entry form, either from your Delta Dealer (listed under "roots" or "MACHINERY" in the classified pages of your phone book), or by sending the coupon on this page.
- In not more than 150 words, complete this statement: "I like Delta Power Tools because..." No fancy writing needed. Just tell us, in your own words, why you like your Delta Tools. Statements will be judged on sincerity and logic.
 - Take a picture of your workshop that shows the tool arrangement to best advantage. Use your own flash equipment, or borrow a friend's. Pictures will not be judged on professional photographic skill, but on practical arrangement for most efficient use of available space. If there are any special features of your shop of which you are proud, tell us about them in a note pasted on the back of your shop photo.
- Mail entry form, statement, and photo to: Contest, Delta Power Tool Division, Rockwell Manufacturing Co., Pittaburgh 8, Pa.

ELTA QUALITY POWER TOOLS

Inother Product by Rockwell



Easy to Win

Remember, you don't have to have an expensive shop to win this contest. Entries will be judged not on the amount of money you've spent to build and equip your shop, but on the common sense you've shown in selecting and using your tools, and on your ingenuity in utilizing available shop space efficiently.

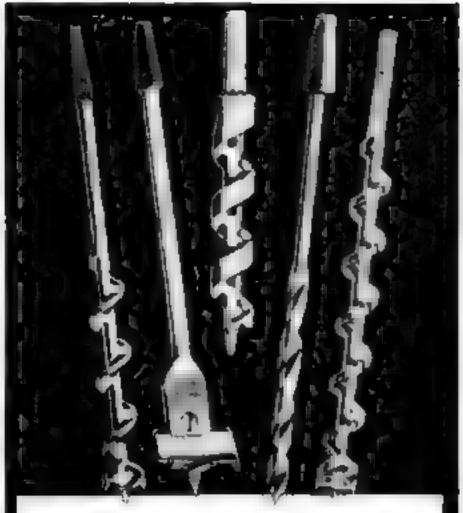
Here are the complete contest rules:

- Contestants must five in the United States or Canada, and own three or more individual Dalta Fower Tools, or a complete DataShop, Data s one-moter combination of the fourbasic power tools—saw, jointer, drill press and sender.
- Employees of Rockwell Manufacturing Company or its advertising agency—or members of their families—are not eligible to compute.
- Entries must be an or accompanied by an afficial entry form.
 Bioborote or "dressed up" entries will be discorded.
- Contest closes July 15, 1955. Entries must be postmarked on or before that date.
- Winners will be notified by mall on or before November 1, 1955. Complete list of winners will be supplied as request.
- Decision of judges is final, in case of ties, duplicate awards will be made.
- All entries become the property of Rockwell Manufacturing Company, and none will be returned.
- Awards will be in the form of certificates redeemable at authorised Delte Dealers in Delte Fawer Tools and excessionies up to the face value of the certificate.

Get Your Entry Blank NOW!

If you own three or more Delta Tools, you have as good a chance as anyone to win \$1000 worth of additional Delta Tools, or any one of the other fourteen valuable Delta power tool and accessory prizes. So get started now! Get your entry form from your Delta Dealer (listed under "TOOLS" or "MACHINERY" in the classified pages of your phone book), or send the coupon below.

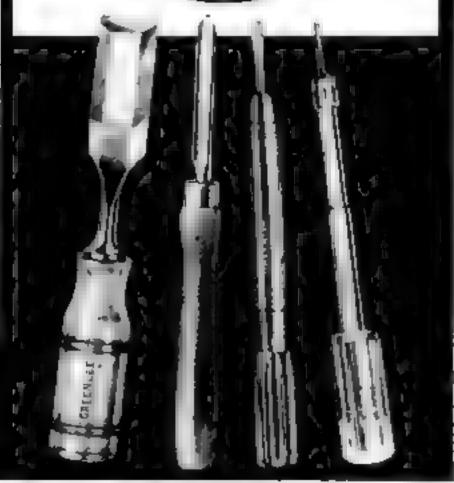
	vision, Rockwell Manufacturing Co.
5046 PL Lexington A	Lve., Pithburgh 8, Pa.
	an official entry blank for the Delta OME WORKSHOP" Contest.
Name-	
Name Address	



high-quality hand tools for finer workmanship

Do the job easier and better with tour wife tools. Auger bits, electric-drill bits, atter boring tools, chisels, gouges, spirar screw drivers, push drills, and many more. All expertive made of top-quality materials for long life, for results. At leading hardware and building supply tracers. Write for folder, Greenlee Tool Co., 2122. Columbia Avenue, Rockford, Illinois.





People Growing Taller, Beds Made Longer

You just have to look at your children and their friends to know that Americans are getting taller all the time. The change is so great that a new standard bed and longer X-ray tables are being made.

Army figures tell the story. The height of the average American man increased six-tenths of an inch between World War I and World War II, and nine pounds were added to his frame. The number of men who are five feet 10 inches and over has increased 45 percent since 1918. The number over six feet has increased 70 percent.

Beds Are Growing, Too

Bed makers had been uneasily aware that the current standard bed, which is just right for a five-foot 10-inch man, was rapidly becoming an anachronism. Odd-sized beds, mattresses, springs, sheets and blankets began appearing. They were snapped up by an uncomfortable public. Standards for "king-sized" beds were needed, and, in consultation with the Commodities Standards Division of the U. S. Department of Commerce, the bedding manufacturers drew up new dimensions.

New king-sized beds, already in production, will measure 82% inches from end to end. Figuring in the usual six-inch margin, the extra-long mattress will comfortably sleep a six-foot 4%-inch basketball player. It could even accommodate his six-foot 10%-inch teammate, but with no room to spare at the head or foot.

In other fields, adjustable seats in automobiles and controls on factory equipment fit the machine to taller people. One X-ray manufacturer has marketed a new machine with a seven-foot-long table especially designed to accommodate tall patients.

Diet May Increase Stature

No one really knows why man is growing taller. One theory is that a well-fed baby stands a good chance of reaching real physical maturity.

Anthropologists point to small-sized immigrants who entered this country in the last century. Some had been poorly fed in the old country. Their new environment in America did not change their adult physiques, but their children "sprung right up," as one anthropologist put it,

Build that extra bedroom yourself . . . it's easy!

A few hours of your spare time can turn a dusty attic into that extra bedroom you've always wanted. It's an easy job... fun for the whole family. Simply finish the walls and ceiling with Armstrong Temlok® Interior Finish. You'll be surprised at how little it costs, and the finished room will add permanent value and comfort to your home.



You build, decorate, and insulate in one simple application when you remodel with Temlok. Available in tite, plank, and board forms, Temlok is an inexpensive, easy-to-handle wood fiber material. It's factory finished for lasting beauty, adds fuel-saving insulation to the room.



3. The celling's done in no time with Armstrong Temlok Tite. The Lok-Bevel joint hides all nails or staples, helps you do a really professional-looking job. Temlok Tile comes factory pointed in Snow White or Light Ivory. Temlok Tile also comes with noise-obsorbing perforated surface.



Walls are no problem with Armstrong Temlok Plank. The long planks go up fast over wood furring. The exclusive Lak-Bevel* joint makes stapling or nailing extra easy, assures neat, even joint lines. Attractively pre-finished in a random "Suntan Blend," Temlok Plank needs no further pointing.



4. . . ready for daughter, son, or avernight guest. It can double as a sewing or hobby room, too. You'll be so proud—and the family will be so pleased—you'll want to "Temlok" the basement next for that much-needed family workshop.

Ask your lumber or building materials dealer for full details on Armstrong Temlok, He'll be glad to show you samples and give you help with your remodeling plans. For your copy of the free booklet, "New Ways to Remodel Your Home," write Armstrong Cork Campany, 3702 Washington Avenue, Lancoster, Pennsylvania.

* Trade-Mark

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GET THE BEST ... MULTIPLIED

- Not just one "best" tool with makeshift accessories, but the best equipped, complete power workshop maney can buy!
- Not only the tools you need for doing five jobs well, but the best tool for scores of standard and unusual operations?
- Not a shop-full of large individual tools, but a single, compact, movable unit with even greater capacity and precision!
- Not just the best speed for sawing, but the best speed for any operation, automatically set by exclusive Speed-Dial.

- Not only the most accurate power tool for the money, but the safest, most modern, largest selling precision power tool as well!
- Not delivered "knocked down" for you to put together but completely assembled, fully adjusted, all ready to plug int 19" wide, 71" long.
- Not the \$600 you'd pay for comparable tools,
 motors and benches, but only \$269.50 complete.

Even your power tool dollars are multiplied with SHOPSMITHI

SHOPSMITH IS THE BEST 34"
LATHE-full 161/2" awing; the only lathe with universal tool cast that stides parallel to work, dial speed selection, and dial mount which offsets cup tenter for easy tape?

selection, and dial mount which offsets cup center for easy taget turning. SHOPSMITH IS THE BEST 12" DISC SANDER-113 square inches of sanding surface; the only conder with disc feed lever, large tilling fable, locking miter gauge and fence for accurate duplicating jigs. SHOPSMITH IS THE JEST P" CIRCU-LAR SAW-21/2" depth of cut {23/4" on 46° beval); the only saw with quickchange saw erbor, blade-to-fence capacity for cutting 4" # \$" panels exactly in half aither way. SEE SHOPSMITH DEMONSTRATED -at leading hardware and depart-

ment stores or any Montgomery Ward store. Complete \$269⁵¹

SHOPSMITH OFFERS THE ONLY HORIZONTAL DRILL with unlimited side boring capacity, automatic igging with locking miter gauge and fence, reck-and-ginion table raising for extra doweling accuracy.

You can do it and do it RIGHT! Dial SHOPSMITH!

Exclusive Speed-Dial eliminates guesswork, assures correct speed for every job. Just set the dial. Speed adjusts automatically—700 to 5200 rpm. No belts to change.



*Trademark Reg. U.S. Pat Off.



NEW SHOPSMITH HAS POWER-MOUNT!

For quickly adding 4" jointer, 18" jigsaw, paint spray compressor. Permits operation of combination setups—sawjointer, jigsaw-sander, etc.

"POWER TOOL PROJECTS YOU CAN MAKE"

This book shows you how to turn out professional-quality built-ins, furniture and toys. 30 easy-to-build projects. Drawings and step-by-step photos by the hundreds. Shop hints and short cuts. At most news-stands (Fawcett How-To Book 251) or at your SHOPSMITH dealer! Get a copy today!

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Please rush two free books (1) "What to Look for When You Buy Power Tools," valuable shop guide; also (2) data-packed 20-page SHOPSMITH cotalog with complete details, specifications, accessory information.

Name .	
Address	
City	State



Easy Hookups Show Transistor Wonders

[Continued from page 218]

grid, the emitter to the filament, and the collector to the plate.

Transistors are different. Having no filaments, transistors require no A battery. They also work well at much lower voltages than equivalent tubes, usually below 25 volts. With no filament to heat, transistors get to work instantly. They are extremely rugged, long-lived (some makers believe theirs will work 70,000 hours!), compact and light. Battery drain is so low that, in the circuits shown, cells should last almost their shelf life.

Try switching them. FS2500's are tested before shipment and should work in any circuit shown. But they vary somewhat; if you have more than one, try interchanging them for best results.

Be careful about battery polarity. Getting it reversed may ruin a transistor. The NPN's specified normally have the plus side of the power supply to the collector, the negative to the emitter. Don't substitute another type without checking polarity.

Mark battery cases. The flashlight cells must be inserted correctly. Mark the cases with red paint as shown in the drawings, Fit cells with the buttons (positive terminals) at these marks.

Although transistors can be soldered right into a circuit, it is easy to overheat and damage them. The subminiature tube sockets shown eliminate this danger. They also enable you to switch transistors about (always shut off power first).

Prepare the sockets by pushing out two prongs as shown on page 219. Solder the other three prongs to lugs bolted to the panel. Open out socket clips slightly with the point of a pin until the transistor leads just go in without crumpling. It helps to clip them to ** length first.

A good milliammeter, although not a must, shows what is going on and will enable you to obtain fullest battery economy. When it is not connected, bridge meter clips with a bit of wire.

NEXT MONTH: Three more breadboard circuits show how transistors can detect light, create tones and even play simple melodies.

Revolutionary new heating system has individual control for each room

Outstanding comfort and economy.

Same steam supplies heat
and operates turbine-driven
room heater fans

Accurate control of temperature in each individual room has long been the goal of heating engineers. Now, with the Iron Fireman SelecTemp system, this is not only possible, but practical and economical SelecTemp is a unique development in heating, now being enjoyed by thousands of people. Here are a few of the many SelecTemp advantages

Thermostat in each room. Temperature of every most (including bathrooms) can be varied to fit the preferences of the occupants—and without affecting heat in other rooms. Desired warmth is maintained regardless of changes in outdoor temperature, wind direction or velocity, or of heat from sun or fireplace.

Continuous modulated heat, Each room wort automat-

really modulates its heat output, ranging from 100% down to 5% of capacity, maintaining a continuous flow of filtered warm air. Underheating and overheating, associated with "on-and-off" systems, are climinated.

Low initial cost. No other system can be so easily and economically installed in new or existing homes or buildings. Costs no more than many systems with only one thermostat for entire house. Small flexible copper tubing (% inch nominal l.D.) carries atom to each room unit. Return lines are % inch I D. tubing. Unlike "hard" piping, long lengths of copper tubing, easily bent by hand, are smaked into the walls and around obstructions as readily as electric wiring, with a minimum of cutting and fitting. No electric wiring required for thermostals or fans.



Room hosting unit is recovered into wall, with only grille projecting. Can be painted to fit any color scheme. Above illustration shows 12,000 Big and,

Economical operation. Accurate heat control prevents fuel-wasting overheating. Unnecessary heating is eliminated Rooms temporarily unused can be kept cool, but warmed again very quickly, at any time. Each unit automatically regulates its heat output to compensate for warmth from the sun, fireplace or cooking range. Lecate beller enywhere. Automatically fired oil, gas or cook botter can be unstalled in the most convenient.

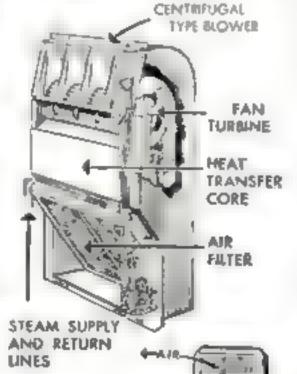
coal boder can be installed in the most convenient place, and yet will supply the required heat to every room

Compact, efficient room heaters. Room heater units are only 18 mehes high. Three sizes: 6,000; 12,000 and 18,000 maximum Btu output. Each unit contains thermostat, copper heat transfer core, spun glass air

filter, and quiet aluminum circulating fan, powered by steam turbine. Turbine rotor and fans are mounted on the same stainless steel shaft, which turns on self-aligning Graphitar bearings, requiring no lubrication. Filtered air is continuously circulated, with both air volume and temperature automatically varied according to room needs.



You owe it to yourself to get full information on Iron Fireman SelecTemp heating before deciding on any heating system. Free 8-page illustrated catalog and technical data will be sent you. Just mail the coupon.



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TILTS FROM 46° BACKWARDS TO 7° FORWARD!



TILTING ARBOR BAND SAW MAKES ALL OTHERS OBSOLETE!

Now! Darra-James introduces the first tilting arbor band saw! Makes usual tilt-table band saws as obsolete as tilt-table table saws! Work stays level—eliminates biggest danger to hands! Does intricate work never before practical on band saw!

Blade changes in seconds! Double ball bearing!
Balanced Wheels! Capacity, 15%" at 45°—12%" at 90°! Available accessories include rip fence, miler gauge, floor stand, variable speed adjustment.

ONLY \$12951

CONVERTS EASILY TO METAL AND PLASTIC CUTTING SAW!



200 FRANKLIN ST., SPRINGFIELD, MAS Please sand me additional information on your tilting arbor band saw.	
Please sand me additional information on your	5
tilting arbor head saw.	
Please send we your free Power Tool Handbook.	
MI	

America's Frozen Frontier

[Continued from page 169]

"Grab on to something," warned the captain.

The ship was shaking and throbbing with the full 12,000 horsepower of all six engines. We hat the ice. The Eastwind staggered, came to a temporary halt, then plowed on, its high, sloped bow literally climbing up on the ice. Snow spray and chunks of ice showered on the deck. Slowly the ship settled, cracking the ice by its sheer weight. Massive slabs, eight feet and more thick, folded upward, climbed up the sides of the ship and fell back.

We had opened a crack. Then we went through, pushing broken ice aside. With roarings and rumblings, we hit the ice again and again, opening cracks and sliding through. This was not only thick ice, it was tough ice. We climbed up on a ridge. Our engines labored. Nothing happened. We were stuck. Capt. Bowerman ordered the engines reversed. We backed off, leaped at the ice again. It cracked, We were through, Then we mounted a hummock that just wouldn't crack. Reversing engines had no effect.

Ship Rolls Out of ley Grip

Then I felt the ship rolling—rolling while stuck on the ice. Capt, Bowerman was using his beeling tanks, an ice-breaker's built-in mechanical roll. As the ship rocked, he worked the rudder and gave the stern a wiggling motion with the engines. (Power can be controlled directly from the bridge.) The propellers were in full reverse, Slowly, groaning as the pressure ice hissed along the sides, we backed down. We were free

"That one is too tough even for the Eastwind," said Capt. Bowerman. "We'll try to get into that lead (a clear-water channel in the ice) to the starboard." He gave the orders and in a few minutes we were through the lead and in a polynya. This is a lake of open water big enough for an icebreaker to turn around in, giving her a chance to backtrack.

Our helicopter, which had taken off

[Continued on page 266]



NEW BEAUTIFUL PRE-FINISHED HARDWOOD PANELING YOU PUT UP WITHOUT NAILS!





Brush Weidwood Confact Camen on study and poner backs of points of contact Let dry Vs hour and repeat When dry poschon panel top with hammer and wood black — lob's danet

Here's real wood paneling that needs no staining or waxing—and you install it with a brush! New Weldwood panels come already pre-finished and waxed by expert wood craftsmen. You can put them up with new Weldwood Contact Cement—no nails, no hard-to-cover-up nail holes.

Panel a wall in your living room, dinette or den-Weldwood gives a lift and sparkle to the whole room. An 8' x 12' wall in prefinished walnut costs about

\$78 — other unfinished decorative paneling from \$23 for 8' x 12' area. See your lumber dealer for pre-finished and regular Weldwood paneling and superior Douglas Fir Weldwood, or visit any of the 73 United States Plywood or U. S. - Mengel Plywoods showrooms in principal cities.

Ask your lumber dealer for

Weldwood®

Pre-finished Hardwood Paneling
UNITED STATES PLYWOOD CORPORATION

World's Largest Plywood Organization
55 West 44th Street, New York 36, New York
U.S.-Mangel Plywoods, Inc., Louisville, Kentucky

America's Frozen Frontier

[Continued from page '61]

from the aft flight deck before we hit the ice, was hovering ahead. The pilot was radioing back the location of leads and cracks between the giant floes.

Those heeling tanks we used are one of an icebreaker's last-resort tricks. On each side, amidships, are tanks with a capacity of 150,000 gallons of sea-water ballast. They are connected by 24-inch lines, permitting 104 tons of water to be pumped from one side to the other in 90 seconds. This provides a man-made roll of 15 degrees from port to starboard and back, enabling the vessel to rock itself loose when stuck in the ice. There are similar tanks from which water can be pumped forward or aft.

Enstwind Can't Make It

Despite her impressive power, the Eastwind did not reach Alert last summer.

In Lady Franklin Bay, heavy polar ice punched a big hole in her bow. She was able to proceed, however, to the Lincoln Sea, where, not far from Alert, ice broke the blade of one propeller.

Capt. Bowerman summoned the Westwind from Thule to take over the mission. The Westwind took on the Eastwind's cargo and proceeded north. She reached the Polar Sea, where a propeller blade was broken by the ice. About five miles from Alert, the Westwind became stuck fast in the ice pack. After a few weeks, strong winds shifted the ice, freeing the ship.

This ice-crushing run to Alert is the supreme test and achievement of an ice-breaker. When the U.S. Navy's new, bigger and more powerful Glacier gets her baptism of ice, she undoubtedly will put in an early bid for the honor of carrying her Polar Bear flag up to Alert at the top of the world.

Note for Motorists

In life as in baseball, it is the number of times you reach home safely that counts—Sign in Itasca State Park, Minn.

The speedy, easy way to get professional sanding results



21/4" Belt Sander

Anybody can get professional invishes with this SKIL Belt Sander. It's so easy to handle—nglitweight, compact, smooth-operating,...in any position. Sands flush to vertical edges and corners. It will handle all your jobs, from rough to final finishing.

Whatever your project—finishing cabinets and furniture, smoothing plaster walls, temoving primer coats, boat building, home repairs of all kinds—here's the sander you need. It's rugged, practical, hard-working





Dependable, long-life combination worm and chain drive.



Flush sanding belt for reaching into corners.



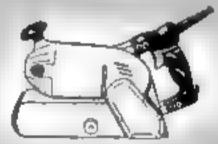
Extra power mator, high quality long life bearing.



Trigger switch in contour handle.



*Comfortable, hand-fitting handles.

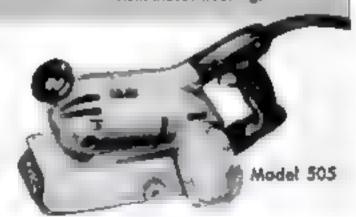


Strong, lightweight die-cost aluminum motor housing.

See all its other features at your dealer's!



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HALF CLEAN ISN'T CLEAN ENOUGH



Half-clean oil wears an engine. Clean oil protects an engine. And Hastings Oil Filter Cartridges—when replaced as normally recommended—keep oil clean from filter change to filter change!

The reason for Hastings amazing performance is Densite—a new filtering material that absorbs dirt through its entire depth. And only Hastings has Densite!

Next time you change oil—change your filter cartridge, too. Ask for Hastings and have clean oil all the time!



Packard Glides on Torsion Bars [Continued from page 1,8]

Thrust, dive, squat. This ugly trio constantly bedevils suspension engineers. The rear springs in a conventional Hotch-kiss drive have the extra job of sending engine and brake forces along to the chassis. In Packard, the torsion bars are spared this task, which is taken over by two pressed-steel torque arms. They run from the rear axle to the frame X member, and they do a lot for the car.

During hard acceleration, the axle thrust transmitted to the frame is both forward and upward, which helps counteract squat. During hard braking, the axle torque sent along the arms tries to hold the frame downward, partly washing out the dive. Neither tendency is wholly canceled—the engineers don't think it should be—but in both traits the car has gone from poor to fine.

A particular advantage of coupling front and rear wheels to a single bar per side is that the frame doesn't have to cope with twisting forces and local spring loads. Body and chassis simply float on four points, the four arms at the ends of the bars; and the body itself doesn't get wracked when the supporting surface is uneven. As a stunt, Packard people like to slam a sedan across a rough diagonal railroad crossing with the car doors on the "ajar" latch. That there is practically no rattling shows, they claim, that body twist doesn't occur. We made crossings of such ferocity as would, on my own car, have popped open the glove compartment and unlatched the hood, and the most the Packard did was utter a few muted clicks.

Leveler. So far, the suspension would give a soft ride and improved handling but it wouldn't do much—except with one specific load—for such other headaches as bottoming, changing height drastically, and having the headlight aim messed up by a load of luggage in the trunk. (A car must cope adequately with anything from one 100-pound lady driver to maybe 1,200 pounds of portly passengers and luggage.) Hitting bottom—

[Continued on page 270]



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Packard Glides on Torsion Bars (Continued from page 268)

which happens when the springs run out of jounce space and the axle housing blips rubber bumpers—naturally occurs much more readily when a large static load has already consumed much of the jounce space.

The answer is ingenious and brandnew (Packard favors the word "revolutionary"). Essentially, it is an extra pair of torsion bars that are automatically wound up by increased load.

Here's what happens:

Mator takes over. Two half-length bars are attached in back close to the main bars. In the middle of the chassis, by the X-member intersection, a geared-down electric motor is placed so that it can wind up or unwind the other ends of these leveling bars. A collar strapped around one of the main bars tells a control system whether the car is down in the stern or down in the bow. Then the control system tells the motor to start up, and which way to run. Levers twist

the half-length bars just enough to raise or lower the rear until the car is level.

This mechanism, which is almost inaudible, keeps the body within a fraction
of an inch of design height with full
load. Hitting bottom while fully loaded,
although possible on a jehosaphat of a
bump, is extremely rare. Headlight aim
stays right no matter how many suitcases
you pile in the trunk. Caster angle in
the front suspension is correct all the
time, not just for one specific load. And
the car looks better, resembling the
slinky vehicles in advertisements.

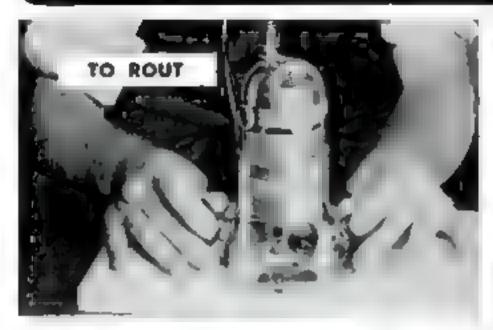
Because it isn't practical to have the leveler working like crazy every time the car hits a bump—it wouldn't react in time, but it'd wear itself out trying—the control system has a six-second time delay built in. If you take plump Aunt Eppie for a ride, the car sags noticeably when she clambers in back. But she scarcely settles herself comfortably be-

[Continued on page 272]





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Packard Glides on Torsion Bars

[Continued from page 270]

fore the leveler gives a faint hum and the car comes back to normal height. This also works in reverse: If six people pile rapidly out of the car, it rises momentarily above normal, the faint hum occurs, and down it goes.

Automatic exceptions. Packard engineers built two other restrictions into the gadget besides the time delay. They didn't want it to work during brakingwhich may easily continue for more than six seconds—because the forward weight shift can improve stopping characteristics. So they wired the leveler through a special stop-light switch so that it doesn't get juice when your foot is on the pedal. And if you get a flat tire, using a bumper jack with the leveler at work is wildly exasperating, because the thing tries valiantly to make the other end of the car come up, too. So there is a "flat-tire switch" under the dash that cuts out the leveler and allows you to jack with only normal annoyances.

Prospects. Torsion bars aren't new, of course; several European passenger cars and most U.S. racing cars have gone to them. (Ordinarily, though, they are frame-anchored at one end.) The leveler does seem to be wholly new. It neatly solves problems that, while troublesome, are perhaps more vexing on spare-no-expense vehicles than on the heaps that most of us drive. The improvement in handling is notable, though perhaps enhanced by Packard's past problems in this department. The company admits to a slight weight penalty (less than a hundred pounds) and slightly higher costs.

Transmission. Until this year, Ultramatic drive has been noted more for smoothness than for zip. It combined a two-stage torque converter with a lock-up clutch that gave direct drive once the car got rolling. In the '55 version, the selector quadrant has two Drive positions, and in one you get the same sedate behavior you got before. In the other, it really lays back its ears.

At moderate throttle in the new set-

[Continued on page 274]

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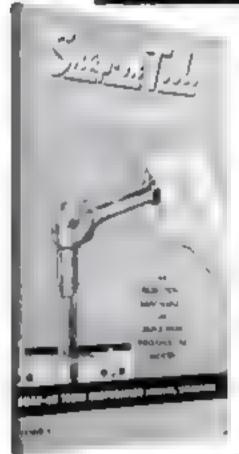


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Packard Glides on Torsion Bars [Continued from page 272]

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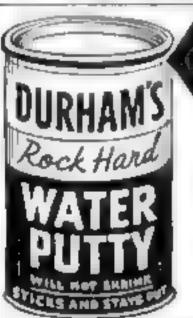
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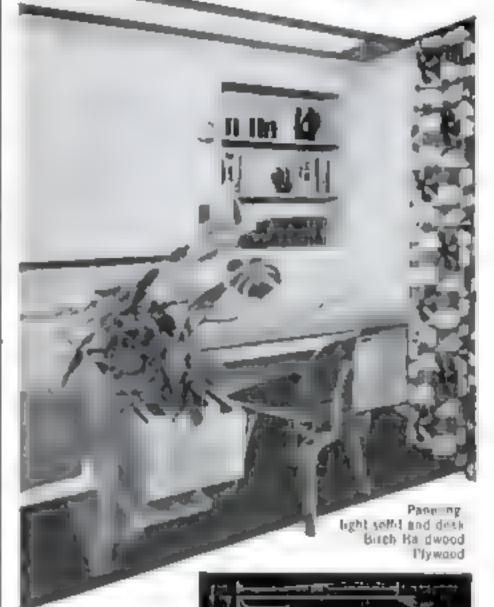
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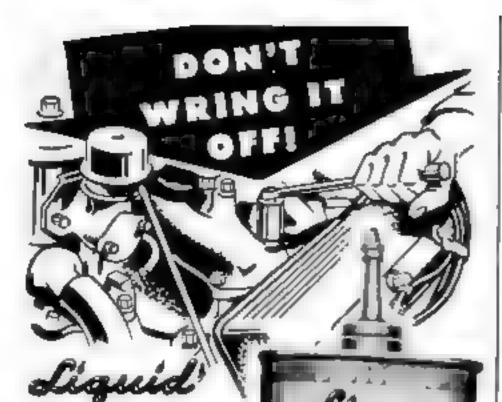
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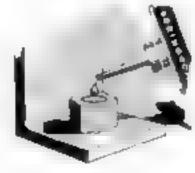
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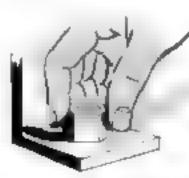
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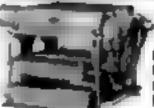
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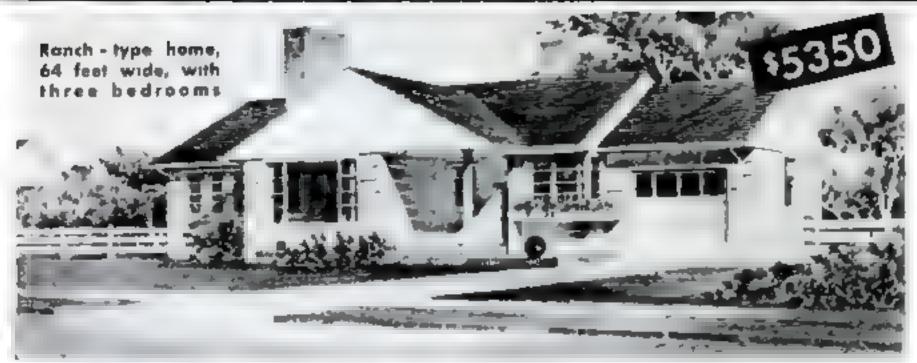
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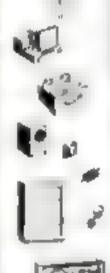


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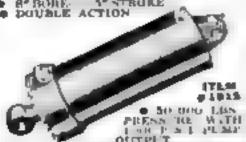
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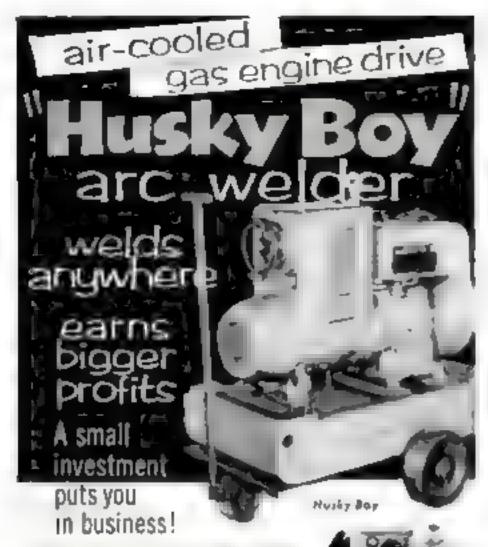
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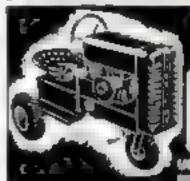
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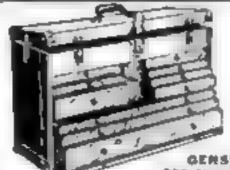
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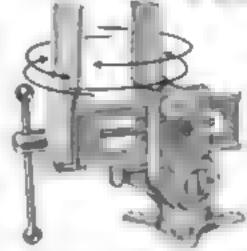
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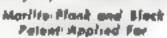
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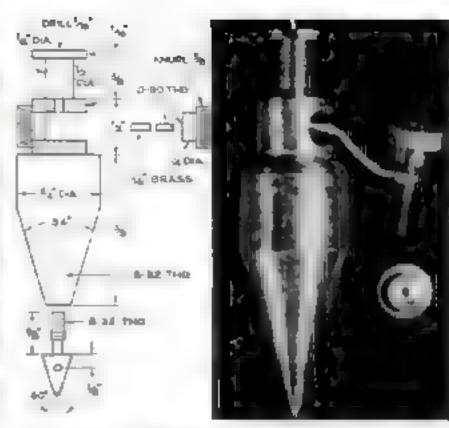
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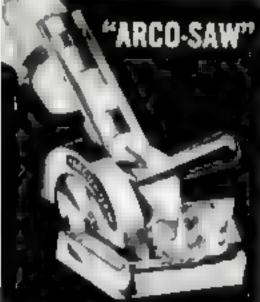
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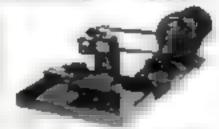


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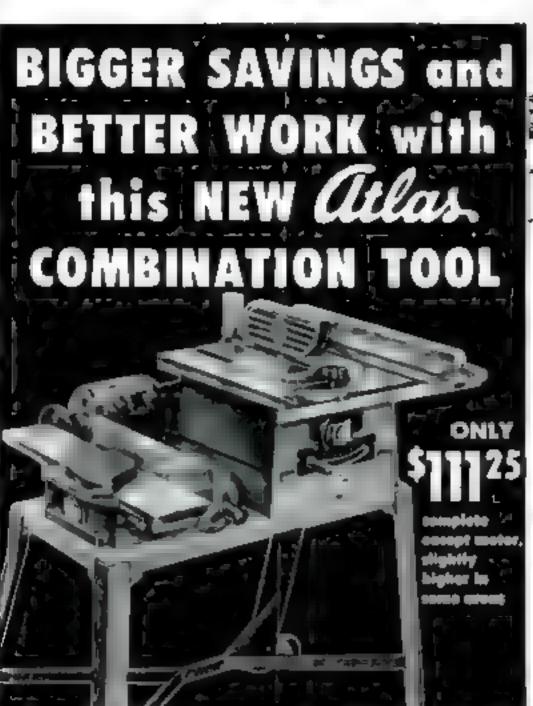
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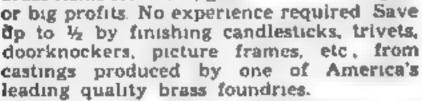
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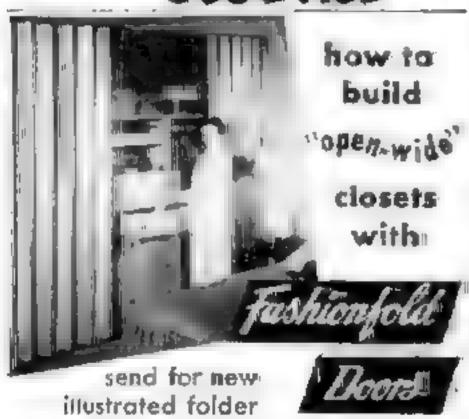
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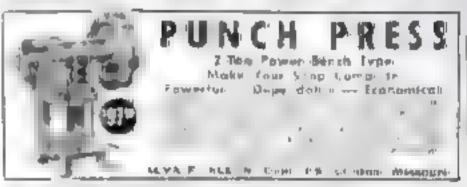
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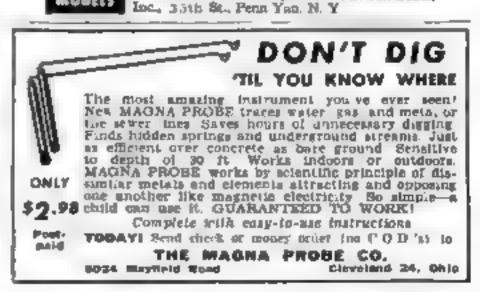
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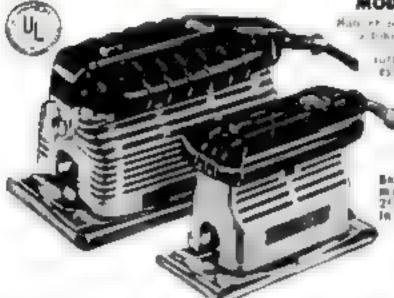


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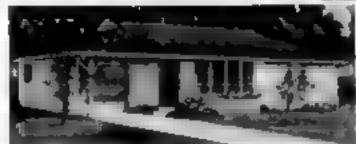
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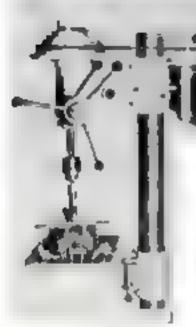


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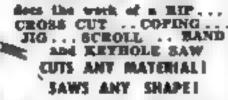
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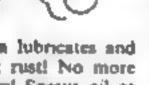
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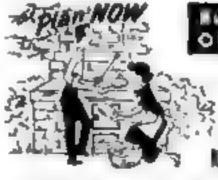
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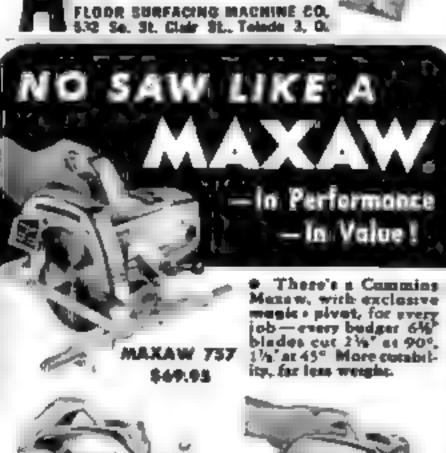
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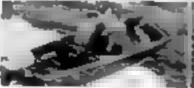
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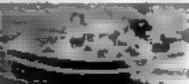
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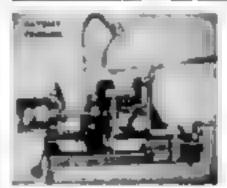
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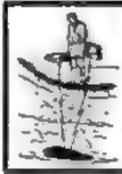
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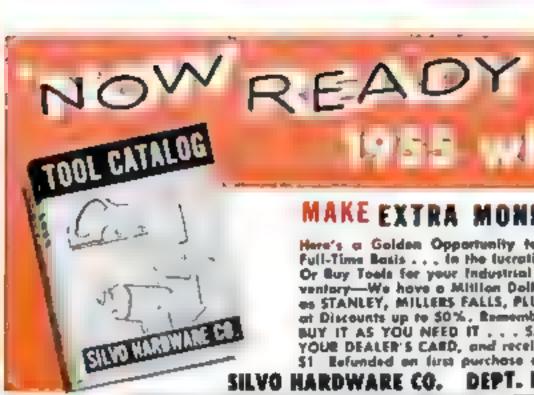
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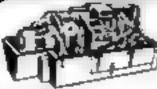
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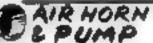




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Coming Next Month:

The 1955 Boat Show

EVERY month a representative group of POPULAR SCIENCE MONTHLY'S readers is invited to tell the editors what they read and don't read, what they like and don't like, about this magazine. Thirty-three percent of these spokesmen for the readers indicated last fall that they wanted more news and features about boats and boating—inboard, outboard and overboard.

So next month there'll be a boat show in this magazine—one that you can see at your lessure, wherever you happen to be, without elbowing your way through crowds. If you have a boat, want a boat, or simply enjoy knowing about boats, be sure to read the March issue of Popular Science Montilly



"My Title Has No Car" [Continued from page 135]

now can bring 10 years in Sing Sing. In New Jersey, to register a car you must have either the manufacturer's certificate of origin or a verification of registration for the past two years. These show that the car has not been stolen since it left the factory, or in the past 24 months.

In Memphis, Tenn., no one can sell a car to a dealer without registering his right thumbprint and signature on the bill of sale. Then the dealer must report all sales to the cops, and not resell for 24 hours to give them time to check all stolen-car lists.

A Master List for Master Thieves

Manufacturers are putting secret numbers on inaccessible parts of every car made. Where and what these are is a closely guarded secret, but all cars can he identified by them. The National Auto Theft Bureau, a nonprofit outfit owned by insurance companies, maintains a master list of all stolen cars that were insured. You can call a National Auto Theft Bureau office—in major cities—and check against the list to see if a car that you are being offered has been stolen.

There is, according to J. Edgar Hoover, an auto theft every 2.3 minutes. Thus if you spent 15 minutes on this article, six cars were stolen before you had read it through, "The value of the property taken in automobile theft," says Mr. Hoover, "exceeds the value of property taken in all other crimes combined."

The title-switcher's whole goal is to hand you a few thousand dollars of this staggering annual loss.

WZQP-P55-AWXE

PORTABLE LIGHT PLANTS

HI-LINE 6000 WATT PLANT 230 v. 60 cyv. A.C. A brate of a power plant with a rugged 14.6 hp. Wissonin engine. Plenty of electric-ity for ranges, water heaters, Creeners, pumple. machinery, etc.
Affords both 110
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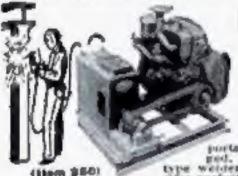
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Heavy duty, made by R. F. MOODRICH for industrial use. Provides instant speed changes for any drive. For machine sools, dryers, printing, conveyors, production lines, hoistening operation requiring variable speed. Employs reliable trouble free" planetary system. No hydraulic power losses infinite range, smooth operation, easy installation. 2 bixes: Us. i hp. 36 lbs.; 1-2 hp. wt. 85 lbs.; 2-3 hp. wt. 105 lbs.; Reg. lat \$226, \$338 and \$332. Our prires. \$78.50, \$88.50 and \$114.50

TON HYDRAULIC PRESS A Demendously powerful bydraulic press, capable of exerting 18,000 lbs, pressure. Pays for itself many times over-straightening bent contimes over-straightening bent meeting rots, king pans, crash-shafts, axies, tink pans, crash-shafts, axies, tink pins and bars, bearings and bushing out from period of pressure under pre-rise control and visible at all times on accurate gauge, Complete with both large and small anvits and ligs to straightest any bind of curve or bend, (Riem 464) wr. 130 lb. Artual list price \$365. Our special \$60.50

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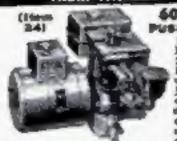
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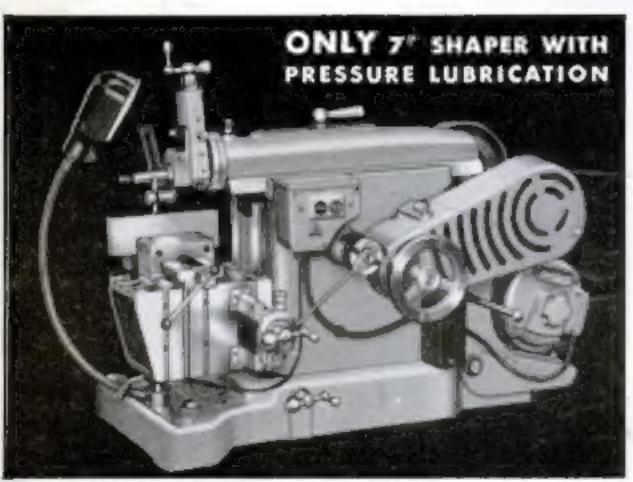
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BRAHMS

Academic Festival Overture Utrecht Symphony, Paul Happerts, Conducting

MOZART

Piano Concerto in E Flat, K 107 Arter Balsam, piono, Winterthur Symphony Orch., Otto Ackermann, Canducting

ВАСН

Toccata and Fugue in D Minor, Alexander Schreiner at the Organ of the Tabernacle Soft Luke City

WAGNER

Die Meistersinger, Prelude, Act 1 Zurich Tonhaile Orch. Otto Ackermann, Conducting

DUKAS

Sorcerer's Apprentice Utrecht Symphony, Paul Happeris, Conducting

MOUSSORGSKY

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